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INTERIM TECHNICAL REPORT

REDUCING PHYSICAL STANDARDS FOR NAVY RECRUITS

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Anita S. West

Ralph E. Williams

Alma E. Lantz

JANUARY, 1973



Prepared under the Navy All Volunteer Force Manpower R & D Program of the Office of Naval Research under Contract N000014-67-A-0394-0008, NR 196-125.

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13. ABSTRACT With the advent of an all volunteer force, concern has been expressed to the effect that future accessions into the Navy might be insufficient to fill the Navy's skilled manpower needs. This report presents the results of the first six months of research of a study to examine the feasibility of enlarging the size of the population from which volunteers are drawn by removing certain physically disqualifying restrictions to enlistment, and to investigate the implications of their removal. (U) The research was organized to answer four basic questions concerning (1) the determination of concept feasibility, (2) the determination of which physical standards might be reduced and the implications of their change, (3) the methodology of the development of an admissions mechanism for predicting success among persons whose physical condition requires some system modification, and (4) the development of an evaluation mechanism for monitoring the program. The report describes the data accessed to address questions (1) and (2), and recommends the reduction of certain physical standards as a safe, effective way to augment an AVF. Several specific preliminary recommendations are listed in the report. The methodology for addressing questions (3) and (4) during the next phase of the study is described. (U)		

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Anita S. West, Ph.D.
Ralph E. Williams, M.S.
Alma E. Lantz, Ph.D.

1. INTRODUCTION AND SUMMARY OF RECOMMENDATIONS

There is evidence to suggest that under conditions of reduced or zero draft the Navy may fall short of meeting its skilled manpower requirements. This report presents the results of the first six months of research under a one-year contract to the Office of Naval Research. The purpose of the study is to examine the feasibility of enlarging the size of the population from which Navy volunteers are drawn by removing certain physically disqualifying restrictions to enlistment and to investigate the implications of their removal.

The balance of this Introduction describes the problem in more detail and summarizes the methodology. Further, it presents a summary of recommendations and refers to research plans for the next six months. Section 2 on Areas of Investigation and an Analysis of the Data, and Section 3, Conclusions and Recommendations, follow the Introduction.

1.1 Purpose of the Study and Background of the Problem

With the advent of an all-volunteer force (AVF) concern has been expressed to the effect that in the future new accessions into the Navy might be insufficient to fulfill the Navy's needs. There are three interrelated factors feeding into this concern:

1. there may be insufficient numbers of volunteers,
2. there may be insufficient numbers of volunteers from the higher mental categories needed to perform jobs requiring skill and education, and
3. an AVF presents some special problems for concern to a nation for whom a representative citizen military has been the tradition and ideal.

Enlarging the base from which it recruits can increase the number of volunteers and thereby permit the Navy to be more selective in recruiting those with higher mental abilities, higher moral qualifications, and from more diverse cultural, economic, and ethnic backgrounds, retaining the tradition of a citizen military.

A recent publication (November, 1972) of the Department of Defense (Reference 1) indicates that no immediate problems (fiscal 73 and 74) exist in accessions either in numbers or mental ability. However, the Bureau of Naval Personnel (Reference 2) lists over 25 open ratings, ratings that are less than 75 percent filled. Although these coexisting conditions can be explained in part by retention/turn-over rates and by a training lag, there exists the suspicion that quality manpower represents at least a component in the explanation. The concern for manpower, at any rate, is sufficiently widespread to make consideration of the problem at this time of high importance. If the problem is not presently a critical one, then contingency plans should be made and piloted during this period.

Minimum physical qualifications for performance of military duty are necessarily established in terms of the manpower required and the demands to be placed upon them. Within this broad framework, a factor of judgement must be applied. Disabling physical conditions are usually a matter of degree and are most often a function of assignment. For example, the high audio acuity of the radioman is not equally essential for the computer programmer. The idea of reducing physical qualifications for

the military as the need for men increases in time of war or national crisis is not a novel one. According to the Office of the Surgeon General reporting on experiences with physical standards during World War II, "if standards are wisely devised and efficiently used, manpower inducted under lowered standards should be capable of making substantial contributions without substantial risks."¹ This reference also reports that lowering standards for mental and personality disorders created the greatest problem. "Mental defects led the list of causes for rejection during the war (World War II) yet they were also responsible for the greatest number of discharges for disability."² The DRI study examines the assumption that recruiting from among those with minor physical impairments, but in general good health, might present a feasible method for filling manpower requirements and with a well thought out process for screening candidates and making assignments can present considerably less risk to the Navy than lowering other standards for enlistment.

1.1.1 Breadth of Effort and Methodology

Medical enlistment standards are designed to minimize other risks to the Navy in addition to those associated with one's ability to perform his job. These risks include health care and costs, pensions, and retirement benefits. This research, in general, sought to address itself to those qualifications that relate primarily to questions of assignment and fixed costs; i.e., non-health related standards for height, vision and hearing (when non-progressive, correctable to normal, and not related to disease), etc. The two medical rejection categories for which exceptions were made were rejections for overweight and high blood pressure, which together account for over 30 percent of all medical rejections. These two problems are addressed directly with reference to medical literature.

The research was organized to answer four basic study questions. These question areas and a summary of the data sources used to address them follow:

1. Evidence of Feasibility

Is there evidence to conclude that present medical standards can be reduced for enlisted recruits without reducing operational effectiveness?

2. Physical Standards

Which rejection standards should the Navy consider changing and what would be the consequences of their removal or reduction? How can individual assessments of residual capability be made without burdening the waiver review system?

3. Admissions Mechanism

What is the recommended differential mechanism for allowing recruiters to evaluate risks with those presently disqualified in terms of their potential contributions and how might this evaluation be modified as a function of personnel needs and manpower availability?

4. Evaluation and Feedback

How might the admissions mechanism be utilized as part of an evaluation tool to monitor the program and to improve the assessment?

¹Department of the Army, Washington, D.C., Office of the Surgeon General, *Physical Standards in World War II*, p. 14.

²Ibid. p. 42.

A partial list of the data sources follows:

- a review of current enlistment standards and medical guidelines.
- re-enlistment criteria.
- waiver processes and experiences, including the MRep program.
- rejection data from the Selective Service System and from the Navy over a recent nine month period.
- job requirements definitions for 26 open ratings from personnel manuals, training documents and films, and study team observations.
- in-port visits on four destroyer class vessels and a 3½ day transit aboard a FRAM I class destroyer.
- visit to the Construction Battalion at Port Hueneme.
- study of civilian occupations and employees considered as examples of maximum physical performance criteria for shipboard watches and details.
- review of experiences of the United States and foreign military services with lowered physical standards.

1.2 Summary of Preliminary Recommendations

With the qualifications stated in Section 3, this study recommends the reduction or removal of certain physical qualifications as a feasible method of enlarging the potential manpower pool. Further, it recommends:

1. a measure of emotional characteristics like maturity during the enlistment process as useful for all enlistees, and especially for those with disfigurements or with impairments requiring physical accommodations.
2. the weighting of all non-health related physical impairments as to type and degree, and with other measures of enlistee attributes; e.g., moral qualifications and mental abilities.
3. the substitution of performance measures of strength of grasp, dexterity, mobility, and stamina, etc. in place of regulations based upon a description of the disqualifying condition.
4. the removal of all appearance related regulations whenever measures of psychological characteristics are judged to be satisfactory.
5. the cessation of automatic refusal for overweight or high blood pressure without more discriminating measures of obesity and hypertension.
6. the inclusion of a program for weight loss within the MRep program.

7. closer involvement of recruiters with details of the physical examination standards, their purposes, modifications and outcomes.
8. the inclusion of new minimum physical requirements (to reflect changes in minimum enlistment standards) for all ratings and training schools so that matching of enlistees, now based upon test scores, preferences, and openings, might also include physical profile for proper placement.
9. the development of a methodology for closely monitoring all persons enlisted under the reduced qualifications program.

Reducing the physical standards for enlistment in the Navy is not expected to result in great numbers of additional enlistments. However, with proper planning and monitoring, a program of reduced qualifications is seen as a safe, effective way of augmenting the AVF.

1.3 Continuation of Effort

During the next six months the research team will concentrate on confirming and/or refining the preliminary recommendations by evaluating some current Navy experience. This examination will include the experience with waivered personnel, a review of separation decisions and the viewing of a select group of performing Naval personnel as a group of new volunteers to determine in which ways, if any, their medical profiles would be insufficient according to present standards, and what difficulties, if any, these sub-standard qualifications have caused. More specificity will be derived for recommendations for increased physical profiling of enlistees and ratings for suitable training and career matching, and for utilizing the profile in the admissions and program evaluation mechanisms. A final Technical Report will be issued during the summer of 1973.

2. AREAS OF INVESTIGATION AND ANALYSIS OF THE DATA

Section 2 reports on the three major classes of data that were compiled and analyzed for this study. These include information on both the formal and informal manner in which the enlistment, reenlistment, rejection and medical waiver processes operate (Section 2.1); the training and assignments of Navy personnel, with special attention to open ratings and shipboard requirements and duties (Section 2.2); and a description of the population presently disqualified from Navy service, with estimates of productivity and attitudes toward enlistment (Section 2.3).

2.1 Current Standards and Procedures for Admission

The enlistment standards of all of the armed forces are designed to minimize the risk of inducting those who would not be suited to the rigors of military life. One aspect of these standards, the physical qualifications, attempts to screen all individuals who might present a risk of exposing others to contagious or infectious disease, those who might require repeated hospitalization or admission to the sicklist, and those whose condition might form a basis for future claims for separation or disability benefits. Therefore, with the possible exception of the sense organs, the physical functioning of persons currently admitted to the Navy is close to optimal. Since the current standards are quite stringent in some respects, it seems possible that men now being refused induction for physical reasons might actually pose little risk to the Navy in terms of medical costs, efficiency, or retraining costs. The risk involved in recruiting these individuals may be described as analogous to the alpha and beta hypothesis errors used in statistics: the error made with the rejection of a potentially suitable recruit, and the error incurred with the admission of an unsuitable one. When manpower requirements are high and the supply is short there has typically been a greater willingness to accept the risk of inducting an unsuitable enlistee. The problem therefore is to determine which of the conditions that currently eliminates a person from military service poses the least risk to the Navy.

2.1.1 Enlistment and Reenlistment Criteria

The Navy has institutionalized methods for screening those who appear to present a risk in regard to physical condition. These procedures include the pre-enlistment physical examination, the reenlistment physical, and the waiver system. The current physical standards for enlistees in the Navy are outlined in Chapter 15 of the Manual of the Medical Department (Reference 3) of the U.S. Navy. The examination for the individual's conformance to these standards is conducted by the medical personnel of the Department of the Army at one of the Armed Forces Examining and Entrance Stations (AFEES). The results of the examination are recorded on the Report of the Medical Examination (Form 88) and the Report of the Medical History (Form 93).

The medical examination is open to a certain amount of subjective interpretation. First, any obviously disqualifying defect is spotted by the recruiter, and the applicant may not then even go through AFEES, although a process of self-selection generally works to preclude this from occurring. Secondly, the AFEES examiners are instructed (Reference 3) that the guidelines are not inflexible and judgement must be used to determine whether the condition is severe enough to warrant disqualification. Finally, some "error" is incurred in measurement at AFEES, e.g. Karpinos (Reference 4) has discussed the problems of accurate measurement of blood pressure levels.

No rigid standards for reenlistment exist. Once a person has demonstrated his ability at his job, the amount of risk to the Navy is greatly diminished. Consequently, applicants for reenlistment are

"fit for duty" rather than "physically qualified". In other words, applicants for enlistment are judged against medical standards, while applicants for reenlistment are judged by their ability to perform their duties.

2.1.2 Medical Rejections

The sizeable number of young men whose enlistment is prevented on the basis of these entrance examinations comprise an important population to study for the assessment of the current physical standards. Three different sets of data were available for this investigation; medical rejection data on draftees, rejection data on all applicants for the service, and data on those applicants rejected from service in the Navy.

The first of the three groups, draftees, represents the largest pool from which to assess the physical and mental characteristics of the disqualified. Although the Navy has a special mission and some very different requirements from the other armed forces (as reflected in the Navy guidelines governing enlistment regulations) there are great areas of the similarity in the required qualifications for acceptance into any of the services. Basically, these are standards established by the Department of Defense and ratified by Congress for use by examining physicians for the Selective Service System. Because of these similarities, and because the Navy is currently exploring ways in which to attract a larger and wider selection of young people, the draftee population is a large and useful study group. The second group, applicants rejected by the Armed Forces for medical reasons, represents a smaller population but has the advantage of yielding data on persons known to be interested in enlistment. Finally the third group, a sub-category of group two, contains data on those persons who applied for duty with the U.S. Navy and were rejected specifically for Navy service.

2.1.2.1 Draftees. Approximately 40 percent of all draftees were medically disqualified during 1971. Even when excluding from this group those disqualified for both medical and mental reasons and those with psychiatric disorders, there remain approximately* 320,000 persons who were not inducted into the service because of medical reasons. To conclude, though, that all of these people would be rejected by the Navy were they inclined to enlist tomorrow would be specious. As Bernard Karpinos points out in his report on draftees (Reference 4) widespread knowledge of the cause for medical disqualifications has permitted draftees to effect rejection by advantageously exploiting the system of regulations. It appears, from his analysis, that many of these young men, were they motivated to enlist, would be accepted even with present regulations. As a starting point, however, it is useful to list the medical diagnoses for each of the major contributors, totaling approximately 50 percent of all rejections (the data presented in the table that follows is calculated from information in Reference 4).

A full discussion of the qualification standards for each of these categories and recommendations for revision considerations is presented in Reference 4.

*Estimated from rates of "medical only" in previous years.

TABLE 2.1
PERCENT OF LEADING DIAGNOSES BY MEDICAL CATEGORY

Diagnoses	1969-1970 Percent
Total disqualifications (all diagnoses)	100
Leading diagnoses	
Failure to meet Weight to Height standards	17.3
Overweight	13.8
Underweight	3.5
Hypertension	9.8
Defects of Joints	6.8
Defective Hearing and Unilateral Deafness	4.3
Congenital Malformations	4.6
Abnormal Urinary Constituents	2.8
Skin and Cellular Tissue Diseases	3.9
	<hr/>
	49.5

2.1.2.2 Applicants for Enlistment. Approximately 10 percent of all candidates for enlistment in the military are rejected on the basis of their pre-induction medical examinations—less than one-third the rate of draftees that fail for medical reasons. One reason given for the higher medical rejection rate among draftees is their reluctance to be drafted; the other is that the population of draftees is biased toward those who may not have anticipated being drafted because of prevailing disabilities.

A comparison of the causes of rejection for the draftees and the applicants for enlistment for a five year period between 1958 and 1963 shows that although the percentage of disqualifications was considerably less among applicants, the distribution of diagnoses was similar.

2.1.2.3 Applicants for Naval Service. The Navy rejected over 13,000 applicants for enlistment last year solely because of medical disqualifications. This number does not include those with combinations of medical, mental, and administrative disqualifications, and further excludes from the "medical" category those with primary psychiatric rejection codes.

Table 2.2 prepared from USAREC coded data written on computer tape (supplied by HumRRO), gives information on 10,564 medical rejections between the period July 1971 to March 1972. Subtracting from this number the 257 people rejected for psychiatric reasons and extrapolating the number for a full year gives an estimated 13,676 medical rejections per year among applicants for enlistment into the Navy. Counting only those in mental categories I, II, and III, the number becomes over 10,000 for the 12 month period.

The draft lottery numbers for male rejections were examined in an attempt to separate the "true" volunteers from the draft-induced volunteers. First, it was noted that over 70 percent of the men who

TABLE 2.2
NAVY REJECTIONS (JULY 1971—MARCH 1972)

Diagnosis	% of Total Rejections	Total	Mental Category					Average AFQT	No Mental Est. for Category	Est. for 12 Mos.
			1	2	3	4	5			
Head, face, neck & scalp	.32	33	1	10	14	6	2	47	0	44
Nose	.19	20	2	5	4	7	1	50	1	27
Sinuses	.07	8	1	3	3	1	0	59	0	11
Mouth & Throat	.48	50	2	14	23	6	4	54	1	67
Ears—general	.88	91	5	21	39	20	3	50	3	121
Drums (perforation)	1.38	143	4	35	60	34	6	48	4	191
Eyes—general	1.44	149	7	31	61	36	7	46	7	199
Ophthalmoscopic	.80	83	2	15	29	25	7	43	5	111
Pupils	.05	6	2	0	3	0	1	57	0	8
Ocular Motility	.48	50	2	9	23	12	2	44	2	67
Lungs and chest	4.32	446	28	119	183	81	21	52	14	595
Heart	1.99	206	5	52	77	50	11	49	11	275
Vascular system	.30	31	2	5	11	10	1	49	2	41
Abdomen and Viscera	4.56	470	13	133	196	87	12	52	29	627
Anus and rectum	.36	38	1	14	12	6	2	53	3	51
Endocrine system	.73	76	3	18	28	17	4	50	6	101
G-U System	3.66	378	18	102	146	84	19	49	9	504
Upper extremities	3.37	348	10	124	138	59	9	54	8	464
Feet	3.30	341	16	86	123	82	31	47	3	455
Lower extremities	6.10	629	26	206	260	107	16	54	14	839
Spine, other musculo-skeletal	2.58	266	15	100	96	37	8	57	10	355
Identifying body marks, scars, tattoos	.24	25	1	5	13	3	3	49	0	33
Skin, lymphatics	5.84	602	20	205	241	113	10	55	13	803
Neurologic	1.23	127	6	18	71	23	2	49	7	169
Pelvic	.16	17	0	1	2	0	0		14	23
Dental	.94	97	5	42	37	11	0	60	2	129
Urinalysis	3.71	383	3	92	128	108	29	46	23	511
Chest X-Ray	.94	97	2	16	37	29	8	40	5	129
Serology	.10	11	0	0	4	5	2	30	0	15
EKG	.03	4	0	2	1	1	0	55	0	5
Blood type and RH factor	.02	3	1	0	2	0	0	59	0	4
Other tests	.12	13	0	5	3	5	0	46	0	17
Height	.21	22	1	5	4	6	1	62	5	29
Weight	30.96	3192	95	833	1206	639	94	53	325	4256
Blood pressure	6.67	688	33	211	244	124	38	52	38	917
Pulse	.31	32	0	9	11	5	5	50	2	43
Distant vision	2.87	296	9	46	85	87	54	37	15	395
Refraction	2.33	241	21	83	89	29	5	60	14	321
Near vision	.08	9	1	1	1	0	6	29	0	12
Heterophoria	.00	1	0	1	0	0	0	67	0	1
Color vision	.02	3	0	1	0	1	1	29	0	4
Red lens test	.00	1	0	0	1	0	0	48	0	1
Hearing	.00	1	0	0	1	0	0	35	0	1
Audiometer	4.72	487	12	95	198	95	56	43	31	649
Other	.40	42	5	11	14	7	2	54	3	56
ALL	99.26	10,256	380	2784	3922	2058	483		629	13,676

received their physicals were between 16 and 18 years old, and were under no immediate threat of the draft. An examination of the lottery numbers for the 19 year olds showed that applicants were randomly distributed over birthdates. It was therefore concluded that most of these men could be characterized as "true" volunteers and could be considered representative of those applicants for an AVF.

2.1.3 Medical Waiver System

If a recruit is rejected by AFEES for failing to meet the current physical standards for induction, he may request that his local recruiter petition on his behalf for a medical waiver. The applicant obtains supplementary medical information about the nature and history of his disqualifying defect from his own physician. These statements are forwarded to the Recruiting Command along with the medical examination forms from AFEES. The Recruiting Command obtains a recommendation from the Chief of Medicine and Surgery and typically acts in accord with that recommendation in regard to the waiver.

The final disposition of the waiver is determined by several factors. The first is the consideration of whether the disqualifying defect will interfere with the performance of military duties or whether such duties will serve to aggravate the defect. Another important consideration is whether the applicant is likely to utilize the defect existing at the time of enlistment as a basis for separation from the service or to file claims against the government at some future time. Further, if the application is accompanied by letters of recommendation from congressmen or military personnel, the application is more likely to be favorably considered. Finally, if BuMed does not recommend a waiver for someone the Recruiting Command feels would be a desirable addition to the Navy, they so inform BuMed and the waiver is reconsidered. The decision to grant a waiver, then is a somewhat subjective evaluation of the "risk" versus the potential contribution to the Navy.

There are currently two categories of medical waivers. The largest number of waivers are granted under the Medically Remedial Enlistment Program (MRep). The MRep program is designed for individuals who do not currently meet the physical standards because of a defect in only one of the categories listed in Table 2.3, but are otherwise fully qualified. After the determination by AFEES that the individual has one of the defects and it is susceptible to correction, the waiver is granted by the Recruiting Command. One condition of the waiver is that the applicant agrees to undergo corrective treatment for that defect on arrival at the respective Naval training center such that he will be fit to undertake the basic training program in six weeks. The overweight and underweight categories often do not go through the procedures for waiver, but are only recorded at the AFEES center, so long as the weight does not exceed 20 percent over the maximum or 10 percent under the minimum requirements. There is however no "remedial" program for deviation from weight standards prior to boot camp. These men are expected to adjust their weight solely by virtue of being exposed to the exercise and diet of basic training.

As seen in Table 2.3, which gives an analysis of persons admitted to the MRep program the first six months of the calendar year of 1972, many were treated for simple hernias or undescended testicles. Although the figures for overweight individuals admitted to MRep were not present in the files of the medical waivers, previous data issued by the Recruiting Command indicates that these account for the wide majority of admissions to the MRep program. In fact, if the proportion of other medically remedial problems to deviations from weight standards has remained constant, the projection of the number of overweight admissions would be approximately 1200 for the first six months, while the number of underweight admissions would be approximately 475.

TABLE 2.3
MEDICAL WAIVERS GRANTED FOR JANUARY-JULY 1972 UNDER MRep PROGRAM

Philonidal cyst or sinus	18
Hemorrhoids	0
Unilateral undescended testicle	86
Undescended testicle and inguinal hernia, same side	5
Hernia in abdominal cavity	99
Hydrocele	15
Hydrocele and inguinal hernia, same side	9
Variocele	3
Orthopedic fixture at site of old fracture	1
Simple goiter	0
Deviated nasal septum	0
External otitis	0
Hyperdactylia (hands and feet)	0
Overweight (not more than 20%)	1200 (estimated)
Underweight (not more than 10%)	475 (estimated)
Total	1911
Estimated Yearly Total	3822

A summary of medical waivers requested in addition to those in the MRep program during the first six months of calendar 72 are given in Table 2.4. The first apparent fact is that more waivers are denied than granted. The table also delineates several physical conditions which are typically waived. These include minor impairments, deformities, or amputation of fingers, underheight (generally for females), nystagmus, history of mastectomy to the breast in males, or history of an ulcer. The table also shows several conditions where the waiver is typically denied. These include personality disorders, abnormalities of lower limbs and feet, spinal abnormalities, and high blood pressure or hypertension and multiple defects. In general, more waivers are granted for defects which are assignment or "personnel" problems than for medical problems.

Examination of the files of medical waivers contained no medical information on the disqualifying condition. The condition was generally stated in a single sentence with no indication of the extent or degree of the condition, making it difficult to tell whether a waiver was denied because the condition was severe in degree or because of the absence of other desirable qualifications. The files did, however, suggest that in all instances where a history of an ulcer or asthma existed and the condition had remained asymptomatic for many years, the waiver was granted.

The waiver system demonstrates a great deal of flexibility in the admission of persons not physically qualified by current standards, although the proportion of those utilizing the system is small. Further, it appears that within the limits of those conditions considered for waiver, many other factors play a decisive role.

TABLE 2.4
MEDICAL WAIVERS REQUESTED FOR JANUARY-JULY 1972

	Granted	Denied
Disease and/or impairment of auditory acuity	14	40
Disease and/or impairment of visual acuity	24	54
Disease and/or impairment of hands and fingers	16	11
Disease or abnormality of lower limbs	4	56
Disease or abnormality of shoulders, arms; limitation of motion	5	10
History of ulcer	17	23
History of asthma	4	16
History of heart disease	2	3
Nystagmus	2	1
Underheight	15	1
Overheight	0	6
Personality disorders	0	18
Skin conditions	6	20
History of mastectomy to breast	7	0
Flat feet	0	16
Spinal abnormalities	0	16
High blood pressure or hypertension	0	11
Miscellaneous	27	59
More than one of above	0	28
Total	143	389
Estimated Yearly Total	286	778

2.1.4 Disability Benefits and Economic Incentives for Re-Enlistment

The conditions of reenlistment for persons having service-connected injuries were examined. As previously noted, there exist no definite physical criteria for reenlistment. However, a disability of beyond 30 percent is considered an adequate basis for separation from the service. Since personnel are required to waive any disability benefits in order to stay on active duty, it was hypothesized that some individuals may request separation in order to receive those benefits, resulting in an unnecessary loss of trained, experienced manpower.

Overwhelming evidence obtained from pay schedules and disability benefits showed that the economic incentive would not influence most individuals to leave the service in order to receive disability benefits. The desire for a military career seems to be the decisive factor for the initial reenlistment. However, after accruing the retirement benefits for years of service, one class of career servicemen who benefit economically from early retirement with disability pay was found. Specifically, a 30 percent disability pays more at the 15th year than does ordinary retirement after 20 years. Similarly, a 40 percent disability pays more than retirement at the 14th year and a 50 percent at the 13th year.

Therefore, at least in a few exceptional cases, persons with disabilities may be encouraged to request separation from the Navy.

2.1.5 Alternative Methods of Evaluating Risk

The use of physical examinations and standards is one means of reducing the number of unsuitable enlistees. Generally speaking, however, the risk to the Navy presented by any deviation from optimal functioning has not been thoroughly assessed; the existing standards are based on common sense assumptions, but have not been substantiated by extensive follow-up studies on the performance, absenteeism, costs, and reenlistment rates of men currently in the Navy who do not conform to these standards.

One method of evaluating the risks of lowering the current physical standards is the preparation of a "cost-benefit" or "cost-efficiency" analysis of persons in the Navy not meeting the current standards. A cost-efficiency analysis would examine the economic cost and/or the benefit of such factors as additional selective placement systems, medical care, separation and/or reenlistment rates, performance on the job, and accident rates for each physical condition or defect. A rough indication of the cost of some of these factors could be obtained from the service records of persons injured in the service or those admitted on waiver, while some of the costs of other factors might be estimated. Since adequate manpower is to be maintained at any "cost," such an analysis would provide the cost of accepting a currently disqualifying physical condition and could be utilized in deciding which physical categories or standards could be reduced with the least detriment to the Navy.

2.2 Navy Performance Requirements

This section deals with the shipboard environment and an examination of the physical requirements for the performance of duties on board ship. Through arrangements made by the Office of Naval Research and COMCRUDESPAC, several in-port visits were made on ships berthed in San Diego, California. A 3½ day transit was arranged from San Diego to Coos Bay, Oregon on board the U.S.S. George K. Mackenzie (DD-836), a FRAM I Class Destroyer. The data reported in Section 2.2.1, *Shipboard Environment*, are based upon observations and interviews conducted during this single at-sea visit and limited in-port contacts. Section 2.2.2, *Examination of Critical Ratings* deals with an overview of the Critical Ratings and includes data from shipboard observations, a visit to the Construction Battalion at Port Hueneme, and from screening numerous training films. Section 2.2.3, *Special Critical Ratings*, describes those ratings for which only limited data were available. Finally, Section 2.2.4, *Physical Requirements Review*, presents the critical ratings in light of the physical requirements necessary for the performance of duty, and questions certain requirements.

2.2.1 Shipboard Environment

The U.S.S. George K. Mackenzie (DD-836), a FRAM I Class Destroyer, was launched in 1945, and is presently manned by 18 officers and 290 enlisted men. Observations were made under conditions of General Quarters and normal steaming routines. Abandon Ship and Man Overboard drills were also conducted. Anti-submarine warfare maneuvers and choppy seas gave the observer a first-hand experience in rolling, pitching, heaving, and yawing.

2.2.1.1 Deck Environment. The decks were continuously wet, but appeared to offer no slippage problems if proper footgear was worn. The weather offered the most extreme environmental changes ranging from warm and sunny with calm seas to cold and foggy with heavy seas. The ratings on the

bridge stood continuously during their watches, some on the steel decking and some on foam padding (Engine Order Telegraph Operator and Helmsman). Each lookout had to contend with his binoculars being sprayed as well as with cold wind in his face. During periods of ship instability no personnel were permitted to work aloft. The Combat Information Center staffed with Electronics Warfare Technicians (EW), Radarmen (RD), and Sonar Technicians (ST) operated generally under low level illumination (red and blue). The environment is crowded and noisy with navigational plots, status board plots, contact reporting, as well as intership communication all going on at once.

2.2.1.2 Engineering and Hull Environment. The machinery repair shop, the shipfitting machine shop, the interior communications shop, and the electricians shop are all small and very crowded with gear. Since these shops are located in the ship's interior, the environment can be influenced by their proximity to the propulsion system (temperature and noise). In some instances it was noted that the noise level from the screws was high enough to null out communication over the loud-speaker system. Ventilation appeared to be quite adequate as did illumination.

The engine room, boilers, generators, evaporators, etc., are located in an environment that is hot and noisy. The noise level is high enough so that one must shout to be heard. The ventilation, although adequate, is localized thereby causing drafts.

2.2.1.3 Habitability. Habitability, as is used here, is that environment on board ship that is not directly associated with the performance of ones duty and includes sleeping, messing, and leisure time.

Wire frame bunks stacked three deep are used by a majority of the ships complement. With age and use, the wire frames sag causing the lower bunk to rest on top of the personal foot lockers. The upper bunk is located very close to the overhead making entry and exit difficult. There is insufficient space between the bunks to sit erect. These bunks are in contrast to the ones on newer ships which appear to offer more room and comfort. The noise level in the sleeping compartments varies over a wide range and is influenced by the proximity to the engine room, screws, shops, etc.

The mess room and galley are small and are structured to serve a maximum number of men in a minimum amount of time. To accomplish this, as one man finishes eating and leaves the mess area, another takes his place. Having a cigarette over a second cup of coffee is not encouraged. Often food is prepared in the main deck galley and passed down ladders to the mess area presenting an additional problem in crowding and safety. The chiefs mess and the officers mess appear to present no habitability problems.

Leisure time is spent mainly on deck, in the mess area, or in the sleeping compartment. Frequently, movies are available in the mess area with the environment being hot, crowded, and smoky.

2.2.1.4 Morale, and Other Factors. Certain factors which are difficult to define but which must certainly play an important role in the overall shipboard environment will be very loosely categorized under "morale". The attitude of the ship's personnel toward the ship was one of pride. The Mackenzie with numerous campaign ribbons on her bridge had just returned from Viet Nam and the crew obviously had a measure of pride in participating in her history. Often they referred derogatorily to the newer class destroyers as not being able to fire as many rounds without "falling apart". Although only limited in-port visits were made, this same pride appeared evident on only one of the other ships visited.

2.2.2 Examination of Critical Ratings

The Critical Ratings examined were taken from the List of Open Rates (BUPERSNOTE 1130, 23 March 1972) and are defined as those ratings that are less than 75 percent filled. The Critical Ratings are presented in Table 2.5. The ratings of EW, HT, RD, QM, and IC were examined in greater detail as these ratings were available on board the U.S.S. Mackenzie. A thorough summary of these ratings is presented in the Appendix.

2.2.3 Special Critical Ratings

Two ratings, the Communications Technician (CT) and the Ocean Systems Technician (OT) were not examined in detail due to the unavailability of data similar to those for other ratings.

2.2.3.1 Communications Technician (CT). Communications Technicians are concerned with the operation of electronic warfare systems and electronics maintenance on these systems. They can deal with linguistics, codes, and intelligence data. In general, the CT should have above normal hearing and no speech impediments.

2.2.3.2 Ocean Systems Technician (OT). Ocean Systems Technicians operate oceanographic equipment to interpret and document the data received. They perform operational and technical maintenance on equipment using tools and devices commonly employed in electronics. The OT must have normal hearing, normal vision ability, and color perception.

2.2.4 Physical Requirements Review

The majority of the data presented here were obtained from the Manual of Qualifications for Advancement (NAVPER 18068C), from training films, and from Chapter 15, Manual of the Medical Department. The data are presented in tables with each table headed by a reference to a particular physical standard. The tables list potential problems to be encountered if the restrictions on impairment are removed or modified; potential solutions; billets in which persons with the impairment in question should probably not be placed, and those ratings for which he would represent a high risk to the Navy.

2.2.4.1 Appearance. Table 2.6 indicates potential problems, solutions, suggested restricted billets, and ratings that represent a risk to the Navy if appearance requirements are removed or modified.

The following appearance conditions are given in Reference 3 as bases for rejection:

- Unreplaced teeth which cause unsightly spaces.
- Disfiguring deformity of the external ear.
- Scars and deformities of the fingers and/or hand which are so disfiguring as to make the individual objectionable in ordinary social relationships.
- Inversion or eversion of the eyelids sufficient to cause unsightly appearance.
- Disfiguring scars residual to corrective surgery of the genitalia.
- Deformity of the skull which affects the military appearance of the candidate.

TABLE 2.5
LIST OF CRITICAL RATINGS*

Group I Deck

Quartermaster, QM3, QM2, QM1
 Radarman, RD3, RD2, RD1
 Ocean Systems Technician, OT3, OT2, OT1, OTC
 Electronics Warfare Technician, EW-, EW2, EW1, EWC

Group II Ordnance

Gunners Mate Technician, GMT3, GMT2, GMT1

Group IV Precision Equipment

Instrumentman, IM3, IM2, IM1

Group V Administrative and Clerical

Communications Technician (administrative), CTA3, CTA2
 Communications Technician (Communications), CTO3, CTO2, CTO1
 Journalist, JO3, JO2, JO1

Group VI Miscellaneous

Lithographer, LI3, LI2, LI1
 Musician, ME3, MU2

Group VII Engineering and Hull

Machinery Repairman, MR3, MR2, MR1
 Molder, ML3, ML2
 Interior Communications Electrician, IC3, IC2, IC1
 Patternmaker, PM3, PM2
 Hull Maintenance Technician, HT3, HT2, HT1

Group VIII Construction

Engineering Aid, EA3, EA2, EA1
 Builder, BU3, BU2, BU1
 Steelworker, SW3, SW2, SW1
 Construction Electrician, CE3, CE2, CE1
 Utilitiesman, UT3, UT2, UT1

Group X Aviation

Aviation Boatswain's Mate (launch and recovery), ABE3, ABE2, ABE1
 Air Controlman, AC3, AC2, AC1
 Aviation Fire Control Technician, AQ3, AQ2, AQ1, AQC
 Aviation Support Equipment Technician (Electrical), ASE3, ASE2
 Aviation Support Equipment Technician (hydraulics and structures) ASH3, ASH2
 Aviation Support Equipment Technician (mechanical), ASM3, ASM2

*BUPERSNOTE 1130, 23 March 1972, defined as less than 75% filled.

- Unsightly deformities, such as large birthmarks, large hairy moles, extensive scars, and mutilations due to injuries or surgical operations.
- Non-spastic contraction of the muscles of the neck or cicatricial contracture at the neck so disfiguring as to make the individual objectionable in common social relationships.
- Unsightly mutilations of the lips.
- Any deformity which is markedly unsightly.

It is recommended that appearance requirements be removed as long as military gear (helmets, gas masks, Oxygen Breathing Apparatus, etc.) is wearable.

TABLE 2.6
APPEARANCE
(Scars, Tattoos, etc.)

Problem	Solution	Restricted Billets**	High Risk Rating
1. Navy Image 2. Public Affairs *3. Instruct a Group	{ 1. New Image 2. 3. Awareness and education of enlisted personnel	Quarterdeck, Television, Interviewing.	JO**, QM**.

* Required in Qualifications for Advancement

** The restricted billets and high risk ratings, although inconsistent with the potential solutions, do offer the U.S. Navy a choice as to its image, i.e., its self-image versus its public image.

2.2.4.2 Speech Impediment. Table 2.7 indicates several potential problems in admitting personnel with intelligible but impeded speech. It is not the intent of this section to recommend removal of requirements that pertain to stuttering, stammering, or lisping that are due to emotional disorders. It is, however, recommended that speech defects caused by deformities or conditions of the mouth, throat, pharynx, larynx, esophagus, and nose not necessarily be cause for rejection.

Although unintelligible speech is not cited in a table, it is felt at this time, that all critical ratings would be a high risk for potential enlistees with this condition.

TABLE 2.7
SPEECH IMPEDIMENT
(Intelligible)

Problem	Solution	Restricted Billets	High Risk Rating
*1. Use Sound Powered Telephone	Under normal conditions these problems should not be critical. Under Condition I the restricted billets should apply.	Net Talker, Bridge, CIC.	EW, QM, AC, JO, RD, IC.
*2. Pronounce Numbers			
*3. Pronounce Phonetic Alphabet			
*4. Instruct a Group			
(MU)5. Sing the National Anthem	5. Remove Requirement		
(MU)6. Sing the Navy Hymn	6. Remove Requirement		

*Required in Qualifications for Advancement

() Required for a specific rating

2.2.4.3 Hearing. Table 2.2 indicates that 4.7 percent of Navy rejections were apparently due to failure of the audiometer test. As stated in Navy regulations, if a subject tests greater than 20 decibels (average of three speech frequencies) ASA in both ears, then he is acceptable if the better ear tests 15 dB (ASA) over the three speech frequencies and 30 dB (ASA) at 4000 hz. While a controlled audiometer test is not readily translatable into an uncontrolled sound pressure measurement of, say, 80 dBA that one could expect to find in the shipboard environment of the machinery repair shop, it is a standard measurement. At this time, no changes in the hearing acuity level are anticipated. If the Navy accepts men currently meeting the acceptable hearing level and permits a hearing aid on the poorer ear, then certain problems could be anticipated. Table 2.8 indicates these potential problems with possible solutions, restricted billets, and high risk ratings.

TABLE 2.8
HEARING
(with aid)

Problem	Solution	Restricted Billets	High Risk Rating
* 1. Use Sound Powered Telephone	1. Ear amplifier <i>not</i> chest**	Net Talker, Bridge, CIC, Quarterdeck,	EW, QM, AC, RD, IC, JO.
2. Breakage	2. Extra Unit(s)	Television,	
3. Loss	3. Extra unit(s) Fastening strap	Interviewing.	
* 4. Swimming	4. No solution		
* 5. Crawling	5. Ear amplifier <i>not</i> chest		
6. Clothing	6. Ear amplifier <i>not</i> chest		
7. Directional Acuity	7. Ear amplifier <i>not</i> chest		
8. Battery Failure	8. Extra batteries		
9. Dislodging of aid	9. Fastening strap		
10. Public Affairs	{ 10.		
11. Navy Image	11. New Image		

*Required in Qualifications for Advancement.

**There are three types of hearing aids currently available: a bone conduction aid with the amplifier at the ear; an air conduction aid with the amplifier at the ear; and an air conduction aid with the amplifier in a pack conventionally carried in a shirt pocket.

2.2.4.4 Vision. Table 2.2 cites almost three percent Navy rejections from a primary cause of failing to meet distant vision requirements. "Distant visual acuity which does (*not*) correct with spectacle lenses to at least one of the following:

1. 20/40 in one eye and 20/70 in the other eye,
2. 20/30 in one eye and 20/100 in the other eye,
3. 20/20 in one eye and 20/400 in the other eye," are cause for medical rejection. The above standards correspond to 79 percent B. V. E., 81 percent B. V. E., and 76 percent B. V. E. The critical ratings cite: ABE—20/30 uncorrected; QM—20/20 corrected; AC—20/20 corrected; IM—20/100 each eye corrected to 20/20.

As the regulations are interpreted, the Navy would accept an enlistee with three percent B. V. E. if it could be corrected to one of the acceptable standards noted above. A primary concern in this regard would be that if the man lost or broke his glasses, he would be a legally blind man serving on board a ship. A preliminary recommendation is to reduce the ABE requirement to 20/20 corrected and the IM rating to only 20/20 corrected without reference to uncorrected vision. From descriptions of IM billets, it would appear that near visual acuity would be a more reliable indicator for this rating than distant visual acuity. Table 2.9 cites potential problems to be encountered if the Navy were to accept men with less than 76 percent B. V. E.

TABLE 2.9
VISION

Problem	Solution	Restricted Billets	High Risk Rating
*1. Use Gas Mask	{ 1. Prescription lenses	Damage Control,	HT, ABE, QM.
*2. Use OBA	2. for masks	Decontam. Team,	
*3. Swimming	{ 3. Headband	Lookout, Launch	
*4. Crawling	4. Extra glasses	and Recovery.	
5. Breakage	plastic lenses		
6. Loss	6. Extra glasses		
7. Binoculars slipping on glasses	7. Rubber eyecups		
8. Sea spray, fogging	8. Anti-fog compound		
9. Running	9. Headband		

*Required in Qualifications for Advancement.

2.2.4.5 Overweight. Table 2.10 indicates only a few potential problems to be encountered if the Navy alters its weight standards. The current standards do not test specifically for the amount of fat on a subject (skinfold determination), but even if a potential enlistee falls within the maximum and minimum weight requirements he may be rejected if considered out of proportion to body structure and

musculature. The required basic training is somewhat difficult to assess. If "boot camp" is divided into two areas: physical training and skill training, it would appear relatively easy to assign overweight personnel to a separate physical regimen. This oversimplified solution does, however, lack one *essential* factor—discipline. The physical training as is customarily performed accomplishes two goals, 1) the physical development of the enlistee, and 2) the self-discipline to react quickly, carrying out orders. Practices such as "double timing" accomplish these two goals.

The high risk ratings cited in Table 2.10 would necessarily apply only to those men whose weight did not reach a desirable level.

TABLE 2.10
OVERWEIGHT
(Obese)

Problem	Solution	Restricted Billets	High Risk Rating
1. Working Aloft			
2. Climbing Ladders			
3. Public Affairs			
4. Mobility			
5. Passageways			
6. Manways			
7. Uniform fit			
	{ It is assumed that the U.S. Navy would expect enlisted personnel to reach a desireable weight after a certain period, so the problems stated in this table would refer only to the early portion of an enlistment. 7. Determine Benefit/Cost	Quarterdeck, Television, Interviewing.	JO, EW, SW, RD, CE, BU, ABE, HT.

2.2.4.6 Questionable Physical Requirements. Upon a cursory examination of training films, observations, and billet descriptions, the following list cites questionable physical requirements found in the Manual for Qualifications for Advancement (NAVPERS 18068C). At this time no rationale is presented for suggesting removal or modification of these requirements. Upon further evaluation this list will be modified.

- Knot tying (Standards for Advancement or S. A.)
- Use OBA (S. A.)
- Use gas mask (S. A.)
- Pronounciation of Numbers (S. A.)
- Pronounciation of Phonetic Alphabet (S. A.)

- Sing National Anthem/Navy Hymn (MU)
- Color Codes of Steam, Air, etc. (ABE)

These qualifications may relate to Navy tradition or to other requirements unrelated to job description which make their retention nonetheless compelling and it is not the purpose of this section to recommend that they be changed. The list is presented merely to question their relevance to current job performance criteria.

2.2.5 Anecdotal Data

Through many conversations with line officers and Chief Petty Officers, both on active duty and in the Naval Reserve concerning the utilization of minimally impaired enlistees in the service, their views were remarkably consistent. These views are briefly summarized below and represent the opinions of approximately 30 officers and 10 chief Petty officers.

- Accomplishment of the mission is the prime concern and if a man can do his job, let him.
- A clear preference was made for the man with a physical impairment and a high mental category over the man with no impairment and a lower mental category.
- Since the officers knew their men and their capabilities, they felt they could assign one of their men with an impairment to an "unrestricted" billet.

In Port Hueneme, at the Construction Battalion Training School, the officers interviewed did not see impaired enlistees as either a morale or supervisory problem. Since the CB's are only rarely in combat areas they seldom perform duties outside of their routine billets.

2.3 Characteristics of the Disqualified Population

2.3.1 Estimated Increase in Manpower

There are a number of factors that complicate an estimate of the increase in manpower that would result from a lowering of the physical entrance standards. Obviously, the size of the increase would be dependent on which specific standards were lowered and the extent of the decrease in the standards. Further, the increase in enlistments would also reflect the attitudinal climate toward the military and whether knowledge of the reduction in standards had reached the target population.

Since the general health considerations outlined in the Manual of the Medical Department were used as guidelines for this study, a lowering of the physical standards cannot be expected to vastly augment the number of men in the Navy, despite the large percentage of those disqualified on this basis. That is, men who pose a sizeable risk of future claims, repeated hospitalization, absenteeism or are not in generally good health will not be considered in the population of potential additional manpower. Specifically, then, this study is primarily concerned with changes in physical standards which are predominately "personnel" ones, i.e., changes in anthropometric standards, vision or hearing deficiencies and amputations which are not associated with progressive disease, rather than "medical" standards which are related to the health and performance of the individual.

Referring again to Table 2.2, which gives the causes for physical disqualification, it will be noted that the estimated total rejections for a recent one year period was approximately 13,000 men. The elimination of all categories reflecting possible disease or functioning necessary to military life or which require extensive changes in the current system, leaves the categories of disfigurement, anthropometric standards, vision and hearing, skin and dental problems. Assuming that some of the men in these categories were disqualified for the presence of disease, a rough estimate of the expected increase might be around 4,000 or about 4 percent of the number inducted each year. However, since this population of disqualified men has been judged to be "true" volunteers and does not include those who might have wished to enlist but were aware that they would not meet the physical qualification, the estimate of 4,000 may be a conservative one.

A further reduction in the estimated increase in manpower would occur if the reduction were initiated only for the highest mental categories. Over all the disqualifying categories, about 40 percent are from mental category I, about 27 percent from mental category II, while 38 percent are from mental category III. Assuming that the distribution of mental categories is the same for each disqualifying condition, reducing the physical standards for those in the top three mental categories would result in the inclusion of approximately 2,800 additional persons.

The two largest contributors to physical rejections are overweight and high blood pressure. Although high blood pressure does not fall within the defined limits of this study, it deserves at least a cursory examination because of the magnitude of the problem.

2.3.1.1 Overweight. Overweight is the largest single reason for physical disqualification and accounts for almost 25 percent of the medical rejections, or approximately 3,400 men over a 12 month period. Overweight is currently assessed by comparison against a chart detailing weight by height and age. Obesity, however, rather than overweight, is the health problem. Obesity may affect normal body functioning, increase the risk of contracting certain diseases and aggravating others and often produces adverse psychological reactions, whereas overweight may affect none of these. Therefore, it is useful to distinguish obesity from overweight: obesity may be defined as the "excessive disposition and storage of fat" while overweight only indicates "over-heaviness" when judged against some arbitrary standard. This over-heaviness may be contributed to by the weight of muscle tissue and bone.

Therefore, it would appear wise to discontinue the use of a rigid standard for overweight and to institute a method of assessing an individual's obesity. While many measures of obesity exist, the most easily administered is a test of skinfold measurement, which consists of pinching or measuring the amount of folded flesh with a caliper at several sites on the body such as the upper arm, chin, abdomen, lower chest, hips and thighs (Craddock, Reference 5). This method gives surprisingly accurate measures of the degree of obesity.

Analysis of the USAREC tapes for a nine month period in 1971-72 showed that approximately 1,861 men who were rejected for overweight were 10 percent or less over the current standards. That is, almost 72 percent of the men currently excluded were within 10 percent of the maximum weight. Another 504 men, or 20 percent were determined to be between 10 and 20 percent overweight. The remainder of those exceeding 20 percent or more overweight accounted for only 209 men or 8 percent. This data is puzzling in the respect that the Medically Remedial (MRep) program was in existence during this period, and should have been available to all men who weighed less than 20 percent in excess of the maximum standard.

Several predictors of successful weight loss are available, and persons determined to be obese might be compared against these predictors: the profile of an individual who can successfully lose weight is that he is male, only moderately obese, is willing to increase his amount of exercise, was not overweight as a child, is emotionally mature, is from a higher social class, is married and has children and has a medical reason for losing weight. Unfortunately, all of these characteristics would not apply to a typical enlistee, but the presence of a few of them might prove to be significant. Further, no weight loss program or dietary control is administered to overweight enlistees during Navy boot camp, as it is in the other services. For example, the Army subjects overweight men to dietary restrictions during the 8 week basic training, and an extraordinary rate of successful weight loss has been reported. Preliminary information has also indicated that the amount of physical exercise is somewhat less during the Navy's basic training than for the other services. Therefore, it would seem advisable to investigate the possibility of initiating a program of both dietary restriction and additional exercise during basic training for overweight enlisted men. The special grouping of men sharing a similar problem and goal which would be necessitated for a weight loss program would provide peer group support as an additional incentive.

2.3.1.2 Hypertension. The second highest cause for physical disqualification from the Navy is high blood pressure. High blood pressure accounts for over 6 percent of all physical disqualifications.

It is difficult to make any recommendations concerning the standards or limits of blood pressure because so little normative data exists. Previous studies have pointed out some of the problems with the accurate measurement of blood pressure levels (e.g., Reference 4) and presented evidence that blood pressure levels are frequently under-read for well motivated volunteers. Further, blood pressure level is positively correlated with a variety of other factors like race, age, socioeconomic class, occupation and geographic region. It has not been determined whether a given blood pressure level represents the same degree of toxicity for every individual despite these other variables. That is, exact norms broken down by these variables have not been established. Finally, no comprehensive follow-up studies of the service's experience with men having high or borderline blood pressure levels have been conducted, and there is currently little information of the effect of this condition on performance of military duties. It is therefore suggested that a study to establish accurate norms for all variables known to be associated with high blood pressure and to evaluate the Navy's experiences with such individuals be conducted.

When a high blood pressure reading is obtained by AFEES, additional measurements over a period of days are typically taken. It is possible to augment this procedure by attempting to determine the etiology of the high blood pressure. Roughly 10 percent of all hypertension is curable and a large percentage is manageable by chemotherapy or dietary control. Further, there is some evidence that high blood pressure, when associated with overweight, may return to normal levels after satisfactory weight reduction. In fact, it has been suggested that the high blood pressure reported in overweight individuals may be an artifact arising from the increased force necessary to compress tissues in the upper arm when making a blood pressure measurement. It seems possible, then, that further investigation may show that the current standards for blood pressure are too inflexible; it may, in fact, show that little risk would be involved by admitting men with certain types of hypertension.

2.3.2 Estimated Productivity

As a first attempt to assess the productivity of persons who would currently be disqualified from the Navy for physical reasons, contacts were made with various social, employment and educational agencies with a clientele of handicapped persons. Although almost none of these people would be candidates now for entrance into the Navy, it was felt that these agencies might provide information

pertaining to a successful technique of selective job placement, special facilities or equipment, health care costs, absenteeism, motivational or interpersonal problems which might be necessitated by a reduction of the physical entrance requirements.

Many satisfactory techniques for selective job placement of handicapped persons exist. With minor variations, all of the methods rely on individualized assessment of aptitudes, usually through a battery of tests, accompanied by some notation of the limitations imposed by the handicap. Without exception, job placement is done on the basis of the individual's ability, rather than his disability. The similarity of these placement techniques to the previously used PULHES system was noted. Other contributing factors to successful placement such as trial placement and education of coworkers and employers were also assessed for their relevance to the potential problems of the Navy.

The most important information gleaned from these agencies is that the largest percentage of "handicapped" workers never have any contact at all with social services. Specifically, almost 4 out of 10 men injured on the job return to their old job and only about 15 percent of all handicapped individuals are not employed.

A review of the research on industry's experience with handicapped workers provided a great deal of data useful in estimating the economic feasibility of reducing the physical standards. For example, a Bureau of Labor Statistics study in 1944 of 11,000 impaired workers, and 18,000 matched unimpaired workers showed that handicapped workers come to work as regularly, have safety records and production records as good as the unimpaired workers. Another study conducted by the Office of Vocational Rehabilitation of 100 employees found that the majority of employers reported that handicapped workers had lower absenteeism, lower job turnover, a lower accident rate, and equivalent productivity. Further, a study of 1,815 physically impaired workers at Lockheed Aircraft Corporation made by California Institute of Technology in 1946 indicated that handicapped workers tended to be more stable on the job, but had a slightly higher rate of excused absences. The study pointed out that, although Lockheed has lost some flexibility time in job assignment, these costs were offset by a number of advantages; the handicapped workers were willing to stay in "dead-end" jobs, they remained in the job longer and had a lower rate of unexcused absenteeism. They also concluded that the presence of these workers served as a positive morale factor to the unimpaired worker. Again, the population included in these studies would most likely not be considered for the Navy, but provides an indication of the possible performance factors encountered in men with physical limitations.

However, in the early 1950's, two masters' theses examined the problems and feasibility of including handicapped personnel in the armed services (References 6 and 7). One study concentrated on the potential use of impaired men in the transportation corps, while the other focused on classification procedures for such personnel, but both concluded that the concept was a viable one.

An evaluation of the productivity of men not currently physically qualified for the Navy was conducted through the local building trades construction unions. It was thought that the working conditions of these men were roughly equivalent to that of the CB's and that the jobs required as much physical strength, skill and endurance as most Navy jobs. Initially, an article stating the purpose of the study which requested a reply from handicapped workers willing to be interviewed appeared in the *Labor Advocate*, the trade newspaper. When this failed to produce many volunteers, foremen and business agents from the individual unions were interviewed and asked about their experiences on the job with men who had physical limitations.

Most of the union bylaws expressly forbid a physical examination as a pre-requisite for entry in any capacity; the only exception to this was the few unions that required evidence that an individual's heart could withstand strenuous physical activity. The entrance examination is a demonstration of proficiency at the trade. Therefore, a small percentage of handicapped men are trained for the trades; e.g., there is a deaf-mute apprentice bricklayer.

Most of the disabling conditions result from on-the-job injuries. All of the foremen interviewed indicated that they had never showed any favoritism toward these men, nor had the men expected it; the softer jobs were reserved for the older workers. The foremen did recognize the worker's limitations, and always placed him accordingly. For example, men who were deaf or hard of hearing worked at a distance from any large machinery with auditory warning signals.

It is the contractor's duty and privilege to dismiss workers who posed a safety problem to others or himself or who showed lower productivity. From all reports such occurrences were infrequent. The biggest problems were with men with back injuries because there is so little one can do on construction without risking further injury.

Almost every possible physical handicap was encountered in at least one of the unions, and most were represented in all of them. Active, productive workers were found who had missing digits, arms and legs; who had severely impaired vision, hearing and speech, and workers with ulcers, diabetes, and epilepsy. A few of these conditions had associated performance problems, like absenteeism with active ulcers, and some required at least a few job placement concessions.

Interestingly, the impaired construction workers appeared to have a special element of pride in their skill and speed which often made them outstanding workers. None of those interviewed or reported on considered themselves handicapped or helpless. This generalized psychological profile of an extremely proud, independent, and determined worker who receives little pity or notice because of his handicap is not applicable to all impaired persons and may be peculiar to the kind of man drawn to construction work, as well as the characteristics of the job and his peer group. It seems plausible, however, that many of the factors which motivate impaired construction workers may also be present in many military jobs.

2.3.3 Attitudes Toward the Military

An effort was made to determine whether the attitudes of persons presently disqualified from the service were any different from the population at large. Since the men defined as the target population by this study would be only minimally impaired, it seems unlikely that they would perceive themselves as "different." Moreover, this target population was not accessible to study since they had likely never had contact with a social agency. Therefore, for both practical and logical reasons, it was assumed that the attitudes toward military of the target population would be no different from the general population.

A recent study from the Institute for Social Research (ISR) called *Youth in Transition* (1972) substantiates these assumptions in part. The study concluded that there was no single "military type" and that enlistees are not characterized by any particular background, ability or personality. Of further interest is the fact reported in the study that while approximately 10 percent of the young men included in the sample of high school students actually attempted to enlist in the military service, only 5 percent of these students thought that they would enlist when queried at various times during their

high school years. That is, almost one-half of the enlistment attempts were stimulated when they were confronted with their first real career decision. Since the impairments of physically disqualified are not sufficient to affect employability, it might be assumed that neither would it affect their career decision and the attitude profile of the study population may be very similar to the profile of the ISR sample.

As a conservative estimate of attitudes of the target population, a survey (performed under a different contract) of severely handicapped individuals is being tapped. They were asked questions concerning conditions under which they would enlist and/or reenlist. If, on the basis of the questionnaires, it is found that severely handicapped persons have attitudes toward the military significantly different from the general population, further study of the attitudes of the minimally impaired will be recommended under this contract.

3. CONCLUSIONS AND RECOMMENDATIONS

Enlarging the population from which the Navy recruits necessarily involves some risk. During the period in which enlistments benefited from the existence of the military draft, recruitment guidelines were optimized for minimizing risk. Any loosening, therefore, of existing regulations requires careful planning and adequate safeguards against increasing costs and decreasing effectiveness.

This study makes no predictions regarding manpower availability under current regulations. Neither can it conclude the number and ability of those required to perform in the Navy in the future. This prediction would be based both on the availability of new technology and on policies relating to the future mission of the Navy. The recommendations in this section are based upon the concern that there may be a need for more and higher ability volunteers from a heterogeneous population, and addresses the questions of lowering physical requirements as a single means of producing more recruits.

The recommendations are based upon the first six months of data gathering and analysis, and should be considered as tentative recommendations pending completion of this research.

3.1 General Statement of Feasibility

The reduction or removal of certain physical qualifications is recommended as a feasible method of enlarging the manpower pool.

The feasibility recommendation is based upon the results of examining the data described in Section 2. These can be summarized under five headings:

1. *Interest.* Interest in the program among Navy officers was necessarily reported in terms of personal anecdote and conversation, but was sufficiently positive, widespread, and of importance to list first among the reasons for concluding feasibility. Almost without exception officer personnel expressed the sentiment that any shortage of trainable persons of good character can better be solved by persons with physical limitations than by the admission of additional mental category IV personnel or those with ambivalent feelings toward service in the Navy. Accommodating to a known physical limitation appeared to be considerably more acceptable than concern about unsatisfactory job performance and social relations because of mental ability, attitude, moral character and the suspicion of drug use.
2. *Ship Assignments.* The possibility of efficiently utilizing persons on board ship with physical limitations is a concept that relates directly to the willingness and capability of ships' officers to make assignments on individual bases and to forgo some of the flexibility one would have with a crew made entirely from a prime physical group. This seems to present no problem since there appeared to be a great deal of flexibility in the assignment of details and watches. Although these extra activities typically fell to men of lower ratings, some flexibility of assignment within a detail or work party existed. The assignments were always made by an officer who knew the men and their limitations. Should medical requirements be lowered only for exceptionally motivated and intelligent persons, their tenure in the lower ratings will be minimal. On larger complement ships and special mission ships (aircraft carriers, tenders, etc.) the possibility of making assignments that do not involve frequent work details, watches, etc. exists. Since distinction is made on some of these ships between the ship's crew and the repair crew it is very unlikely for certain of the personnel to ever engage in combat-connected

activities. On smaller ships not only does each of the officers know his own command, but the ship's Executive Officer is equally familiar with the outstanding capabilities as well as the impediments of each crew member.

3. *Comparable Civilian Occupations.* The performance, attitudes, and productivity of workers in the building trade unions were utilized as a maximum performance criterion for sea duty. The common occurrence of amputated digits, hearing aids, "stiff" ankles, and even missing limbs among men required to work on scaffolds, with power equipment and in inclement weather was observed. Their excellent record of safety, favorable experience with workmen's compensation losses, and absences from work were reviewed with the contractors for whom they work.
4. *Job Requirements.* The physical requirements of the open ratings reviewed during this phase of the work were generally less demanding than those required simply for living and maneuvering aboard ship during Conditions 1 and 2. Exceptions, e.g., special high degree of visual acuity for certain ratings, are noted in Section 2.3. In general, however, physical standards for the current open ratings were lower than those now required for Navy enlistment, and minimum ship functioning requirements could be substituted without loss of efficiency. Several qualifications for advancement require physical capabilities not apparently related to job performance and are noted in Section 2.
5. *Industrial and Military Experience.* The history of satisfactory industrial and military experience with persons with at least as severe handicaps as those in the target population is given as further justification for the lowering of physical standards. See Section 2.3.2.

Safeguards for instituting a program of reduced qualifications should include a complete work history of the applicant, consideration of waiver of claims for injury directly related to the condition in question, and should generally follow a "move slowly" policy. A pilot study involving a quota on persons with particular impairments (see Tables 2.6-2.10) should allow a sufficient number into the service in order to make extrapolations based upon actual experience, but should not "load" particular impairments. Allowing less than 3,000 people into the program would result in less than 4 percent of accessions and about half of one percent of the total force. Enlisting only 40-50 persons dependent upon corrective lens for adequate vision (out of the estimated 400 persons rejected for distance vision) will provide experience for monitoring resulting problems and at worst could result in 50 people (rather than 400) requiring separation or shore-based billets should anticipated problems be unamenable to solution.

3.1.1 Recommendations.

A list of nine recommendations follows, each with a summary of the rationale for its inclusion and a discussion of the specifics of its operation.

1. *A measure of emotional characteristics like maturity is recommended for all recruits during the enlistment processes and especially for those with disfigurements or with impairments requiring physical accommodation.*

Before even considering an applicant with a physical impairment for service, a necessary, but not sufficient condition of his acceptability should be satisfactory emotional confrontation to the impediment. Having a speech impairment, for example, might not make the applicant unfit for many open ratings, but his acceptance of and ability to deal with the impediment would be vital in any

assessment of his qualifications for duty. Those with sustained losses of fingers or toes due to injury as an adult may have experienced a different set of reactions than those with early childhood disfigurements resulting in less emotional trauma, but more difficulty with physical accommodation. Both reconciliations, physical and emotional, are required for a successful military career, and an instrument for measuring maturity to cope is recommended. Until an instrument or interview session is designed and implemented, measures of tenacity or the ability to deal with frustration as evidenced by school and job behavior patterns might be utilized for this measure. There are many factors which influence the success of a person's performance in any job. The Navy already recognizes the importance of motivation and tempers its standards for an applicant who appears to be highly motivated toward a Navy career. An under-motivated crew member can be considerably more handicapped on board a ship than the decrease in effectiveness associated with a physical limitation.

Of those who are separated from the service (all services) because of request for medical separation, it has been estimated by Army physicians at Fitzsimons Army Hospital (Denver) that 80 percent are more related to attitude and other mental-emotional measures, than to the disability, making the investment of a psychiatric screening cost effective for all new accessions as well as those in the reduced qualifications program.

2. The weighting of all non-health related physical impairments as to type and degree and with other measures of enlistee attributes is recommended.

The weighting of all non-health related physical impairments (perhaps with a profile system similar to the PULHES) should be directly related to the number and importance of jobs for which the applicant is unsuitable and the fixed costs associated with accommodating his size or deficiency (stocking oversized shoes, providing plastic prescription lens, etc.). Should health related qualifications be lowered, health care and pension risks would also have to be quantified as to amount and probability. The quantifier associated with the medical profile should then be weighted with mental and moral qualifications for an assessment of acceptability. As one of the three indicators becomes below the desirable level, the other two can be required to be higher in order to accept the enlistee. This means that those with physical impairments requiring system modification would have to have higher mental and moral qualifications. The recruiting manual gives an "Odds for Effectiveness" table. This chart is prepared for recruiters to assess the probable success of potential recruits as a function of mental and moral characteristics. The chart might be modified (as a nomograph) to include a third dimension of medical characteristics as the mechanism for weighting all three enlistee attributes. This measure of effectiveness should result in a single number, the minimum for which could be raised and lowered as a function of the manpower environments and Navy needs, without major revisions to the methodology, i.e., with a monthly or quarterly minimum acceptability standard.

3. The substitution of performance measures of strength of grasp, dexterity, mobility and stamina are recommended in place of regulations based upon a description of the disqualifying condition.

An effort should be made to augment current examination and placement procedures with more tests of functional effectiveness. Measurements of functional capabilities—manual dexterity, strength of grasp, specially devised climbing tests, etc. would determine residual capabilities of a congenital or sustained impairment. Predictions of performance could be made with greater precision and without arbitrary standards based upon probability parameters for people with particular physical conditions.

Standardizing these performance measures would permit individualized assessment without unduly burdening the waiver-review system.

4. The removal of all appearance related regulations is recommended whenever measures of psychological characteristics are judged to be satisfactory.

Although appearance-related disqualifications account for the rejection of probably less than 50 men per year, identifying body marks, tatoos, benign scars and burns, etc. in no way hamper an individual from performance of duty. Should his ability to handle social situations be judged to be satisfactory, the only rationale for rejecting the applicant would be rejection of the image he conveys. Since social acceptance on the basis of appearance is an out-of-date notion, this report recommends that well adjusted persons in this category be accepted for enlistment, other attributes being desirable. The process of self-selection in volunteering for duty in the Navy with a facial or body disfigurement biases the population toward those at ease with the condition.

5. The cessation of automatic refusal for overweight or high blood pressure is recommended until more discriminating measures of obesity or hypertension are observed.

Overweight, accounting for 25 percent of all medical rejections, is currently assessed by comparison against a chart detailing weight by height and age. Obesity, however, is the health problem and measures to distinguish the two, such as the skinfold are recommended. See Section 2.3.1.1.

The second highest cause for physical disqualification is high blood pressure. Because of the reported unreliability of the measuring instrument and the problem of repeatability associated with the subject himself, and because of the variety of other factors that influence blood pressure levels (see Section 2.3.1.2) a single and definite standard for all candidates seems inadvisable. The determination of the etiology of the high blood pressure, studies on the effect of this condition on performance, and the establishment of accurate norms for variables known to be associated with high blood pressure are recommended.

Finally, the high correlation between the two disqualifying conditions serves to keep overweight candidates with measurable high blood pressure from the MRep program since the existence of more than one disqualifying condition is reason for ineligibility. Since there is evidence that high blood pressure, when associated with obesity may return to normal after satisfactory weight loss, and since the pressure reading itself may be an artifact arising from extra tissue in the arm, the automatic ineligibility of candidates with these two co-existing conditions might be inadvisable and the decision to admit the MRep should be left to the discretion of the examining physician.

6. The inclusion of a program for weight loss within the MRep program is recommended.

A program during boot camp for those who are overweight, pass the profile test for those likely to be able to lose weight and are highly motivated potentially good recruits (higher mental ability and moral characteristics) is recommended as a mechanism for saving some of the 4,000 volunteers rejected yearly for overweight. This program would keep overweights together during boot camp and could include regularly scheduled physical activities (especially designed for overweights) in addition to the routine boot camp activities, as well as special dietary controls and education. The Army currently has a weight loss MRep program as part of basic training that lasts eight weeks and is virtually 100 percent

effective. The current practice in the Navy of enlisting those who are less than 20 percent overweight (or 10 percent underweight) under the MRep program makes no special provisions for the recruit to encourage his weight loss (or gain). Recruitment as well as retention success could benefit from this rather low cost (as compared with surgical repair) program.

7. Closer involvement of recruiters with details of the physical examination standards, their purposes, modifications and outcomes is recommended.

The need for recruiters to be able to utilize an instrument for assessing emotional stability early in the enlistment process, the need for them to be involved in change, feedback, and evaluation of change, and the need for more regional authority for making decisions in borderline cases were all observed. The system of quota enlistments does not necessarily match the recruiter's needs with those of the Navy, and in many cases, makes his requirements (for sheer numbers) contrary to the more discriminating requirements of the Navy, which in turn serves to make the AFEES task more difficult. All of these needs might be realized through the establishment of a career rating in recruiting as one technique to justify increased training time and longer tenure in office to "get smart" about choosing successful applicants.

8. The inclusion of new minimum physical requirements for all ratings and training schools is recommended. Matching of enlistees, now based upon test scores, preferences and openings should also include physical profile for proper placement.

New minimum physical standards for each rating and training school would have to reflect any changes in minimum admissions standards as a result of this program. Further, the profile system for both ratings and enlistees should be consistent with each other for automated matching of recruit to school or job. More work in this area is contemplated as part of the second phase of this study.

9. The development of a methodology for closely monitoring all persons enlisted under the reduced qualifications program is recommended.

There are two elements necessary for the success of a program to reduce physical qualification: interest and cooperation of Navy officer personnel, and careful planning and monitoring of the pilot program. The interest has already been noted. Part of the difficulty in making recommendations for reduction or removal of specific qualifications has been the lack of available hard data on specific experiences within the Navy. Plans are being made to make follow-up studies on waivered personnel and existing personnel who could not meet present qualifications. These studies will be valuable for improving the analyses of the implications of changing certain standards. Often, however, it is slow, awkward, and many times disappointing to find incomplete and contradictory information in file data gathered for other purposes. A pilot program of reduced qualifications admissions (RQA) should be established with provision for monitoring within the program design. Not only can the success or failure of the program be established more quickly, but information on the RQA's can be used for updating the Odds for Effectiveness chart (or whichever mechanism is used for admissions). See Recommendation #2.

3.2 Conclusion

Reducing the physical standards for enlistment in the Navy will probably not result in great numbers of additional enlistments. However, even 3 percent of all new accessions (assuming projected accessions remain approximately the same as in 1972 and RQA's become stable at about 3,000) when limited to the higher mental categories can be an important supplement in the AVF. Experience with

the problems of selection, training and assignment and their solutions will serve to be the deciding factor in the reduction or broadening of all or selected parts of the program. Continued research into planning the program and anticipating its ramifications will increase the probability of its success. A final report of work under this contract will be published during the summer of 1973.

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APPENDIX

APPENDIX

DECK GROUP

Quartermaster (QM)

1. *Scope of Duties*

Quartermasters stand watch as assistants to officers of the deck and to the navigator; serve as steersmen and perform ship control, navigation, and bridge watch duties; procure, correct, use and stow navigational oceanographic publications and oceanographic charts; maintain navigational instruments and keep correct navigational time; render "honors and ceremonies" in accordance with national observance and foreign customs; send and receive visual messages; and serve as petty officers in charge of tugs, self-propelled barges, and other yard and district craft.

2. *Special Physical Requirements:*

The QM rating must have normal color perception and vision correctable to 20/20 in order to recognize and use all visual signal flags, numeral pennants, and repeaters; identify ships, aircraft, foreign flags, and ensigns of maritime powers; identify all lights used in navigation.

3. *Related Civilian Jobs*

Pilots, small craft operators, navigators.

4. *Typical Billets*

Assistant Navigator
Quartermaster of the Watch
Helmsman
AFT-Steering Helmsman
Engine Order Telegraph Operator
AFT Lookout (JL Talker)

5. *General Physical Requirements*

- a. Night vision to locate and operate light switches.
- b. Simultaneous right and left handed operations (engine order telegraph).
- c. Grasping (helm control).
- d. Normal vision to see compass.
- e. Finger dexterity to plot problems on maneuvering board.
- f. Visual identification of national and merchant flags of principal maritime and major naval powers and personal flags of the U.S.
- g. Verbal acknowledgment of orders.
- h. Manual and visual use of sextant.
- i. Manual dexterity to adjust magnetic compass.
- j. Finger dexterity to wind chronometers.
- k. Visual-manual radar bearings.
- l. Handle navigational equipment.
- m. Visual identification of stars using Star Finder.
- n. Visual identification of lights, buoys, storm warning signals, etc.
- o. Audible sound signals, whistle, bell.
- p. Hand and wrist for using sling psychrometers.
- q. Transmit and receive on voice radio.

- r. Transmit and receive semaphore or flashing signals.
 - s. Ability to work aloft.
6. *Billet Environment – Bridge*
The bridge can be crowded with a high level of noise (mostly talking). It may be cold if the wing bulkheads are open. The duties are performed standing on a hard deck except for the helmsman and EO Telegraph Operator who stand on sponge padding.
7. *General Work Assignments*
The QM must repair and maintain the following:
- a. Steering gear
 - b. Antenna System
 - c. Radiotelephone system
- Electronics Warfare Technician (EW)**
1. *Scope of Duties*
EW Technicians operate and perform organizational and intermediate level maintenance on Electronic Support Measures (ESM), Electronic Countermeasures (ECM), and supporting equipment. They extract, interpret, and apply data from intelligence publications and reports. They evaluate, interpret, and determine equipment capabilities and limitations; evaluate, interpret, process, and apply intercepted signal data, Electronic Intelligence reports (ELINT) and Electronics Warfare (EW) tactics and doctrine to operational needs; train and supervise personnel in EW assignments.
 2. *Special Physical Requirements:*
None
 3. *Related Civilian Jobs*
Electronic Inspector
Electronic Engineer
 4. *Typical Billets*
ECM Supervisor
ECM Operator
EW Status Board Keeper
Surface Search Radar Operator
EW Talker
 5. *General Physical Requirements*
 - a. Must be physically able to administer First Aid.
 - b. Ability to work aloft.
 - c. Manual operation of ESM, EW, ECM systems.
 - d. Visual capability to analyze scope traces showing frequency, pulse width, type scan and rate, and pulse rep frequency, AM, FM emissions, and complex modulations.
 - e. Must have verbal ability to serve as a telephone talker.
 - f. Must stand for long periods of time as status board keeper.
 - g. Must have manual dexterity to plot diagram of EW area and CIC.
 - h. Must be able to install field changes to electronic equipment.

- i. Must be able to repair, adjust, and test coolant and air systems.
- j. Must exhibit ability to prepare and maintain logs, publications, and records.

6. *Billet Environment – CIC*

The physical environment in the CIC is generally the same regardless of outside conditions. The CIC is maintained in semi-darkness at all times with EW technicians operating under illumination from the radar sets or from red or blue lights. For maintenance duties the EW can operate under a localized white light. The physical environment can become extremely crowded (as under GQ), to just crowded (as under Condition III). Although the EW may work on a task alone, there are generally many others in the immediate area. Operating under GQ there can be a great deal of confusion with many people talking, relaying orders, etc. Except for the telephone talker and status board keeper, the surveillance duties are performed sitting down. Maintenance often calls for stooping and kneeling to repair the equipment.

7. *General Work Assignments*

- Administrative
- Field Maintenance
- Corrective maintenance
- Preventive maintenance

Radarman (RD)

1. *Scope of Duties*

Radarmen function as plotters, status board keepers, radio and telephone talkers and maintain CIC displays. They operate surveillance and altitude radar, IFF, and associated equipment. They serve as watch supervisors and section leaders; interpret and evaluate presentations, tactical doctrine, procedures for radar navigation, and provide assistance related to AAW and ASW operations.

2. *Special Physical Requirements*

Normal color perception. Normal hearing. No speech impediments.

3. *Related Civilian Jobs*

- Air traffic control
- Electronic Repair

4. *Typical Billets*

- Radar control officer
- Air Intercept Controller
- Air Search Radar Operator
- NC-2 Operator
- Air Vertical Plotter
- Surface Summary Plotter
- PRITAC Net Recorder
- Data Link 14 Readout Operator
- AC Net Talker/Recorder
- DRT/SSSC Plotter
- CID Net Plotter
- Tactical/Net Recorder

NC-2 Plotter
CID Net Talker/Recorder

5. *General Physical Requirements*
 - a. Must be physically able to administer First Aid.
 - b. Ability to work aloft.
 - c. Manually start, stop, and operate, and tune radar, ECCM, radar repeaters, and IFF equipment.
 - d. Visually distinguish contacts and interference.
 - e. Must be able to operate remote control units for radiotelephone.
 - f. Must transmit and receive on RT.
 - g. Manually solve problems on DRT on plotting table.
 - h. Maintain status board.
 - i. Must be able to prepare and maintain logs and charts.
6. *Billet Environment – CIC*
The environment for RD is essentially the same as for EW Technicians.
7. *General Work Assignments*
The RD must repair and maintain the following:
Remote communication system.
Recorder-Reproducer system.
Radar Distribution systems.
IFF interrogator.
ECW receivers.
Countermeasures set.
Antennas, indicators.
Antenna pedestal.
Direction data converter.
Range, Azimuth indicator.
ASROC Fire Control.

ORDNANCE GROUP

Gunners Mate Technician (GMT)

1. *Scope of Duties*
Gunner's Mates operate and perform organizational and intermediate maintenance on guided-missile launching systems, missile launching groups, rocket launchers, guns, gun mounts, turrets, projectors, and associated handling equipment; make detailed electrical, electronic, hydraulic, and mechanical casualty analyses; inspect and repair electric, electronic, hydraulic, and mechanical systems and servosystems; test and inspect ammunition and missiles and their components; supervise personnel in handling and stowage of ammunition and missiles and their components; inspect and repair magazines and ammunition stowage spaces; supervise crews assigned to ordnance equipment.

Gunner's Mates (T) perform organizational, intermediate, and depot maintenance; store, inspect, test, adjust, repair, and package nuclear weapon components and associated equipment; assemble, disassemble, and convert nuclear weapons, warheads, and/or components.

2. *Special Physical Requirements*

The GM rating must have normal color perception.

3. *Related Civilian Jobs*

Ordnance

4. *Typical Billets*

Ordnance Technician
ASROC LCCP Operator
Gun Pointer

5. *General Physical Requirements*

- a. Mobility to inspect magazine areas.
- b. Dexterity to operate and maintain sprinklers.
- c. Dexterity to use hand, electric, and pneumatic tools.
- d. Must be able to operate nuclear handling equipment.
- e. Must have general strength to handle nuclear weapons.
- f. Color vision to identify electric codes and identification markings.

6. *Billet Environment*

The environment can be on the deck area maintaining and repairing the ASROC or the gun turrets. The environment of the ammunition storage area is extremely confined and can be noisy and hot.

7. *General Work Assignments*

Not identified.

PRECISION EQUIPMENT GROUP

Instrumentman (IM)

1. *Scope of Duties*

Instrumentmen perform organizational and intermediate maintenance on mechanical instruments, office machines and navy timepieces, and implement Navy or Mechanical Instrument Repair and Calibration Shop (MIRCS) procedures.

2. *Special Physical Requirements*

The IM rating must have normal color perception and 20/100 vision in each eye correctable to 20/20.

3. *Related Civilian Jobs*

Watch Repair
Instrument Repair
Standards Technician

4. *Typical Billets*

Instrument Technician
Stretcher Bearer

5. *General Physical Requirements*
 - a. Must exhibit finger dexterity to assemble, disassemble, and repair clocks, watches, and test equipment.
 - b. Must be able to visually distinguish metal temper.
 - c. Must be able to use hand tools and jewelers tools.
6. *Billet Environment*

Not identified.
7. *General Work Assignments*

Not identified.

ADMINISTRATIVE AND CLERICAL GROUP

Journalist (JO)

1. *Scope of Duties*

Journalists assist public affairs officers and officers in command with public affairs; prepare material contributing to the home town news program of the Navy; write Navy news releases and feature articles from personal interviews, examination of messages, and witnessing of events; process news photographs and write captions; coordinate special events; prepare histories; prepare material for commercial radio and television use; serve on the staff of American Forces Radio/TV stations; prepare official correspondence and directives; prepare and lay out Navy publications such as newspapers, command information brochures, and cruise books; and assist in preparing speeches/presentations on naval topics.
2. *Special Physical Requirements*

None
3. *Related Civilian Jobs*

Journalist
Radio - TV
Staff Writer
4. *Typical Billets*

Journalist
JZ Talker
Tender
Hoseman
Nozzelman
5. *General Physical Requirements*
 - a. Must exhibit dexterity to splice magnetic tape.
 - b. Physical dexterity to operate still cameras.
 - c. Dexterity to process film.
 - d. Finger dexterity to type.
 - e. Must have oral capabilities to conduct personal interviews.

6. *Billet Environment*
Not identified.
7. *General Work Assignment*
Not identified.

MISCELLANEOUS GROUP

Lithographer (LI)

1. *Scope of Duties*
Lithographers perform graphic reproduction with lithographic, letterpress, and related graphic equipment; assist in determining the appropriate style or format for publication; produce and strip negatives and positives; prepare line and halftone camera copy; utilize darkroom equipment; process lithographic plates; set type and prepare forms for printing; operate process cameras, presses, and bindery equipment; and perform organizational maintenance on graphic equipment. These skills are applicable to single-color and multi-color printing.
2. *Special Physical Requirements*
None
3. *Related Civilian Jobs*
Lithographer
Pressman
Draftsman
Binder
4. *Typical Billets*
Lithographer
JZ Talker
Messenger
Hoseman
NBC Monitor
Tender
Nozzelman
5. *General Physical Requirements*
 - a. Must exhibit dexterity to handle drafting tools.
 - b. Exhibit manual dexterity to operate process camera.
 - c. Exhibit dexterity to process film.
 - d. Exhibit dexterity to operate litho-presses and other presses.
 - e. With arms and legs use a stitching machine.
 - f. Must be able to visually determine color characteristics.
 - g. Must be able to make multi-color layouts.
6. *Billet Environment*
Not identified.

7. *General Work Assignments*

The LI must repair and maintain the following:
Paper drilling machine.
Paper cutter.
Printing press.
Offset press.
Offset duplicator.

Musician (MU)

1. *Scope of Duties*

Musicians provide music, as members of official navy unit bands, for various functions and ceremonies in the interest of morale and esprit de corps, and in support of recruiting functions and public and foreign relations; perform on one or more designated instruments; and perform other musical skills as may be required in the performance of the rating.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Musician

4. *Typical Billets*

Not identified.

5. *General Physical Requirements*

- a. Must exhibit dexterity to copy music, arrange, tune, maintain, and repair instruments.
- b. Must have sufficient hand, arm, and shoulder flexibility to conduct, and give baton signals.
- c. Must exhibit mobility to maneuver a marching band.
- d. Must be able to sing the National Anthem and the Navy Hymn.
- e. Must identify triads, chord progressions, and cadences.

6. *Billet Environment*

The environment may be indoors or outdoors in any type of weather. Prolonged standing may be required.

7. *General Work Assignment*

Not identified.

ENGINEERING AND HULL GROUP

Machinery Repairman (MR)

1. *Scope of Duties*

Machinery Repairmen perform organizational and intermediate maintenance on assigned equipment and in support of other ships, requiring the skillful use of lathes, milling machines, boring

mills, grinders, power hacksaws, drill presses, and other machine tools; portable machinery; and all handtools and measuring instruments found in a machine shop.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Machinist
Patternmaker
Fabricator

4. *Typical Billets*

Utilityman
Damage Control Plotter
Pipe Repair
Tender
NBC Monitor
Messenger

5. *General Physical Requirements*

- a. General strength to handle heavy accessories.
- b. General strength to handle gas cylinders.
- c. General strength to handle stock material.
- d. Arm and hand operation of lathes, planers, shapers, milling machines, and other power tools.
- e. Manual dexterity to use pantograph.
- f. Visual acuity to identify different metals and alloys.

6. *Billet Environment – Shop*

The Machinery Repair Shop is located in the ship's interior and may be shared with other ratings. On small ships, only absolutely essential machinery is available for maintenance and repairs. The shop is crowded, dirty, and noisy. Illumination and ventilation appear adequate. The MR may or may not work in isolation.

7. *General Work Assignments*

The MR is responsible for repair and maintenance of the following:

Lathes
Drill Presses
Milling machines
Power hacksaws
Band saws
Shapers

Hull Maintenance Technician (HT)

1. *Scope of Duties*

Hull Maintenance Technicians plan, supervise, and perform tasks necessary for fabrication, installation, and repair of all types of shipboard structures, plumbing, and piping systems. They qualify in the skills and use of damage control, NBC defense, CBR defense, and firefighting.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Ship joiner, plumber, driller, painter
Pipefitter
Angle shear operator
Welder
Calker, chipper
Carpenter
Hull planner-estimator
Maintenance pipefitter, plumber, plasterer, painter
Vertical punch operator
Shipfitter

4. *Typical Billets*

Investigator OBA
JZ Talker
Sounding and Security
Stretcher bearer/utilityman
Plotter/Messenger

5. *General Physical Requirements*

- a. Must have the dexterity to use electric or pneumatic tools, oxyacetylene torches, welding equipment, woodworking tools, hand tools, and firefighting equipment.
- b. Must have the strength to handle compressed gas cylinders.
- c. Must be able to use OBA.
- d. Must exhibit manual dexterity in carpentry, boat repair, welding, cutting, sheet metal working, steamfitting, and plumbing.
- e. Must exhibit mobility and strength to force entry during firefighting.
- f. Must be able to operate all shipboard pumps.
- g. Must exhibit mobility to service all ship compartments.
- h. Must be able to rig emergency communications.
- i. Must be able to maintain logs, records, and reports.

6. *Billet Environment – Shop*

The HT's general work station is located in the interior of the ship and, therefore, no day/night distinction is involved. The workshop with tools is located near the crew's quarters and can cause noise problems for off-duty personnel. The workspace is fairly limited and may be shared with another rate (ET for example). Personnel crowding may, at times, be a problem but the major crowding is from tools, gas cylinders, workbench, etc. The overall noise level from the screws is high enough to hinder hearing the intercom system.

7. *General Work Assignments*

The Hull Maintenance Technician is responsible for repairs, maintenance or performance of the following:

Ventilation system
Soft water reducing valve

Drain, Fuel oil, and firemain piping
Fire station equipment
Duplex pressure proportioner
Hull inspection
Water motor proportioner
Emergency fresh water tank
Ladders and handrails
Water washdown system
Bicarbonate fire extinguishing system
Fixed CO₂ system
Gas works

Molder (ML)

1. Scope of Duties

Molders operate foundries aboard ship and at shore stations; make molds and cores, rig flasks, prepare heats, and pour castings of ferrous, nonferrous, and alloy metals; clean castings; pour bearings, and perform organizational and intermediate maintenance on assigned equipment and in support of other ships.

2. Special Physical Requirements

None

3. Related Civilian Jobs

Molder
Steelworker
Furnace operator
Coremaker

4. Typical Billets

Not identified.

5. General Physical Requirements

- a. Exhibit general strength to handle gas cylinders.
- b. Exhibit general strength to charge a furnace.
- c. Exhibit general strength to carry and pour casting metals.
- d. Exhibit general strength to lift and handle molds.
- e. Exhibit dexterity to construct molds and cores.
- f. Exhibit dexterity to use molders' tools as well as conventional hand and power tools.
- g. Exhibit visual acuity to identify metals and alloys.
- h. Distinguish colors in metal tempering.
- i. Distinguish color codes for patterns.

6. Billet Environment

The shop environment would be similar to that of a small foundry—dirty from metal dust and hot. For safety reasons, generally more space is available for molding. There is usually sufficient space to carry the casting metal from the furnace to the molds without undue danger of tripping. Sandblasting and grinding can cause a noise problem.

7. *General Work Assignments*

Not identified.

Patternmake (PM)

1. *Scope of Duties*

Patternmakers make wooden, plaster, and metal patterns, core boxes, and flasks used by molders in a Navy foundry; mount patterns on match plates and follow boards for production molding; make master patterns; make fullscale layouts of wooden patterns, core boxes, and templates; index and store patterns; and perform organizational and intermediate maintenance on assigned equipment and in support of other ships.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Cabinetmaker
Metal former
Carpenter

4. *Typical Billets*

Not identified.

5. *General Physical Requirements*

- a. Distinguish color codes for finish patterns.
- b. Distinguish different types of wood.
- c. Exhibit dexterity to operate woodworking machinery.
- d. Exhibit general strength to handle wood stock.
- e. Exhibit dexterity to make patterns, templates, and core boxes.

6. *Billet Environment*

Not identified.

7. *General Work Assignments*

Not identified.

Interior Communications Electrician (IC)

1. *Scope of Duties*

IC Electricians operate and perform organizational and intermediate maintenance on interior communications including gyrocompass, voice IC, alarm, warning, ship control, entertainment, plotting and automated propulsion equipment.

2. *Special Physical Requirements*

Normal color perception.

3. *Related Civilian Jobs*

Radio mechanic and helper
Radio supervisory engineer

Electrical planner — Estimator
Radio Installer — repairer
Ship electrician

4. *Typical Billets*

I. C. Repairman
Gyrocompass watch, JV talker
Electrical Repairman

5. *General Physical Requirements*

- a. Must be physically able to administer First Aid.
- b. Must be able to strip wire and cable and prepare wire for splicing, terminal lugs, etc.
- c. Must be able to visually distinguish color codes.
- d. Must be able to use common hand tools including soldering equipment.
- e. Must have the manual dexterity to test or repair cable, relays, lamps, potentiometers, transformers, resistors, and switches.
- f. Must be able to wire a chassis.
- g. Must be able to manually use a tube tester, VTVM, strobe, oscilloscope, and tachometer.
- h. Need color perception to read color codes on wires and electrical components.

6. *Billet Environment — Shop*

The IC shop is located in the ship's interior near the crew's quarters and is crowded with gear and the gyrocompass. This work area is well illuminated and relatively noise-free. Work performed in the shop is, by necessity, cramped. The IC Electrician may perform his duties alone, but not necessarily isolated.

7. *General Work Assignment*

The IC Electrician performs repair and maintenance on the following:

Fixed CO₂ systems
Gyro and IC switchboards
Gyrocompass
Movie projectors
Alarm switchboard
Magazine sprinkling alarm system
Ship control order system
Metering and indicating
Announcing system
Intercom units
Sound powered telephone
Synchro signal
NC-2 Plotter
DRT
DR Analyzer
Underwater log and dummy log
Motor generators

CONSTRUCTION GROUP

Engineering Aid

1. *Scope of Duties*

Engineering Aids plan, supervise, and perform tasks required in construction surveying, construction drafting, planning and estimating, and quality control; prepare progress reports, time records, construction schedules, and material and labor estimates; establish and operate a basic quality control system for testing soils, concrete, and construction materials; prepare, edit, and reproduce construction drawings; and make and control surveys, performing such tasks as running and closing traverses, staking out for excavations, and obtaining and converting field notes into topographic maps.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Construction draftsman
Rodman
Surveyor
Soil Testing
Concrete Testing

4. *Typical Billets*

Not identified.

5. *General Physical Requirements*

- a. Exhibit general strength to carry tripods and levels.
- b. Exhibit mobility over varied terrain as a rodman.
- c. Exhibit dexterity to use hand signals in surveying.
- d. Exhibit dexterity to use drafting tools in the construction of maps.
- e. Exhibit general strength to handle concrete test cylinders.
- f. Exhibit visual acuity to use surveying instruments.
- g. Be able to conduct safety talks.

6. *Billet Environment*

The EA may spend prolonged periods at a drafting table converting field notes to a topographic map. In the field the EA will work under all types of weather conditions as long as visibility is not limited. As a rodman he must traverse rugged terrain. He generally will not operate at night out of doors unless he uses more sophisticated surveying equipment (laser).

7. *General Work Assignments*

Not identified.

Builder (BU)

1. *Scope of Duties*

Builders perform tasks required for construction, maintenance and repair of wooden, concrete, and masonry structures, concrete pavement, and waterfront and underwater structures; initiate

procurement and direct storage of building materials; form and direct efforts of crews to perform rough and finished carpentry; erect/repair waterfront structures, wooden and concrete bridges and trestles; fabricate and erect forms; mix, place, and finish concrete; lay or set masonry; paint and/or varnish new and refinished surfaces.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Construction worker
Bricklayer
Mason
Carpenter
Highway worker

4. *Typical Billets*

Not identified

5. *General Physical Requirements*

- a. Exhibit general strength to handle pavement breaker and hammer drive tools.
- b. Exhibit general strength to handle and dress timber.
- c. Exhibit general strength to handle and erect scaffolding.
- d. Exhibit dexterity to use hand tools.
- e. Exhibit visual acuity to use surveyors level.
- f. Exhibit visual acuity to match paints.
- g. Be able to conduct safety talks.

6. *Billet Environment*

The BU billet environment is analogous to that of a construction worker. He may be required to work under all types of conditions, indoors and outdoors.

7. *General Work Assignments*

Not identified.

Steelworker (SW)

1. *Scope of Duties*

Steelworkers perform tasks directly related to fabrication and erection of pre-engineered structures; control jobsite deployment of materials and equipment; and direct and coordinate the composition, training, and efforts of crews who fabricate, assemble, erect, position, and joint structural members and fabricated sections.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Welder
Construction worker
Steel worker

4. *Typical Billets.*

Not identified.

5. *General Physical Requirements*

- a. Exhibit general strength to lift and move heavy objects.
- b. Exhibit general strength to erect scaffolds.
- c. Exhibit general strength to operate pavement breakers and hammer drive tools.
- d. Exhibit dexterity to splice lines.
- e. Distinguish colors of metal tempers.
- f. Distinguish color codes of gas cylinders.
- g. Be able to conduct safety talks.

6. *Billet Environment*

The environment for the SW is essentially the same as that for the BU.

7. *General Work Assignment*

Not identified.

Construction Electrician (CE)

1. *Scope of Duties*

Construction Electricians plan, supervise, and perform tasks required to install, operate, service, and overhaul electric generating and distribution systems and wire communication systems; control activities of individuals and crews who string, install, and repair interior, overhead, and underground wires and cables, and attach and service units, such as transformers, switchboards, motors, and controllers; schedule and evaluate installation and operational routines.

2. *Special Physical Requirements*

Normal color perception. Vision correctable to 20/20.

3. *Related Civilian Jobs*

Electrician

Estimator

Motor Repairman

4. *Typical Billets*

Not identified.

5. *General Physical Requirements*

- a. Exhibit general strength to erect poles.
- b. Exhibit general strength to use pavement breaker and hammer drive tools.
- c. Ability to climb poles.
- d. Exhibit dexterity to make cable connections.
- e. Distinguish wire color codes.
- f. Be able to conduct safety talks.

6. *Billet Environment*

The billet environment of the CE is essentially the same as the BU.

7. *General Work Assignment*

Not identified.

Utilitiesman (UT)

1. *Scope of Duties*

Utilitiesmen plan, supervise, and perform tasks involved in installation, maintenance, and repair of plumbing, heating, steam, compressed air, fuel storage and distribution systems, water treatment and distribution systems, air-conditioning and refrigeration equipment, sewage collecting and disposal facilities, as prescribed by drawings and specifications; schedule and evaluate installation and operational tasks, prepare records and reports.

2. *Special Physical Requirements*

None

3. *Related Civilian Jobs*

Pipefitter

Plumber

Sanitary Engineer

Heating and Ventilation

4. *Typical Billets*

Not identified

5. *General Physical Requirements*

- a. Exhibit general strength to use pavement breaker and hammer drive tools.
- b. Exhibit dexterity to install galley equipment.
- c. Exhibit mobility to maintain boilers.
- d. Be able to conduct safety talks.

6. *Billet Environment*

The billet environment of the UT is essentially the same as that of the BU.

7. *General Work Assignment*

Not identified.

The *Related Civilian Jobs* of the critical ratings in the Construction Group were observed with the cooperation of unions in the Denver area. It was felt that the environment of Navy SEABEE personnel would be fairly analogous to that of their civilian counterparts. Obviously this analogy does not extend to combat readiness. During the period of our observations we asked specifically to observe any workers with impairments. Most of the union foremen denied that they employed men with impairments, yet we observed active workers with missing digits and artificial limbs. The foremen explained that these men were *not* considered impaired. Although the SEABEES may operate under periods of severe demands, it is felt that their billet environment is, in general, the same as that of the civilian. (Refer to Section 2.3.2)

AVIATION GROUP

Air Controlman (AC)

1. Scope of Duties

Air Controlmen perform air traffic control duties in air control towers, radar air traffic control facilities, and air operations offices ashore and afloat; operate radiotelephones, light signals and systems, and direct aircraft under VFR and IFR conditions; operate surveillance radar, direction finding, and identification equipment (IFC); operate ground- and carrier-controlled approach systems and air-surveillance radar approach equipment; assist pilots in the preparation and processing of flight plans and clearances; and maintain current flight planning information and reference materials.

2. Special Physical Requirements

Normal color perception. Vision correctable to 20/20. Normal hearing. No speech impediments.

3. Related Civilian Jobs

Air Traffic Controller

4. Typical Billets

DRT Operator

Radio Operator

JG Talker

Status Board Plotter

Approach Controller

Traffic Display

5. General Physical Requirements

- a. Exhibit dexterity to operate electronic equipment and radar.
- b. Exhibit dexterity to operate signal light gun.
- c. Distinguish standard visual signals.
- d. Be able to issue instructions to aircraft.
- e. Be able to issue instructions to emergency vehicles.
- f. Be able to operate interphone communications.

6. Billet Environment

Not identified.

7. General Work Assignment

The AC is responsible for repair and maintenance of the Central landing control.

Aviation Boatswains Mate — Launch and Recovery (ABE)

1. Scope of Duties

Aviation Boatswain's Mates operate, maintain, and perform organizational maintenance on catapults, arresting gear, barricades, and associated flight-deck launching and recovery equipment; operate and service aircraft crash, fire-fighting, and rescue equipment; handle aircraft in carriers and shore; operate, maintain, and repair aviation fueling, defueling, lubricating oil, and inert gas systems; and perform crash rescue, fire-fighting, trash removal, and damage control duties.

Aviation Boatswain's Mates (E) operate, maintain, and perform organizational maintenance on hydraulic and steam catapults, barricades, arresting gear, arresting gear engines, and associated equipment ashore and afloat; operate catapult launch and retract panels, consoles, firing panels, water brakes, chronographs, blast deflectors, and cooling panels; rig, inspect, and proof-load cables and fittings and pour wire rope sockets; and perform aircraft-handling duties related to the operation of aircraft launching and recovery equipment.

2. *Special Physical Requirements*

Normal color perception and 20/30 uncorrected vision.

3. *Related Civilian Jobs*

Not identified.

4. *Typical Billets*

Catapult Operator
Arresting Gear Crew
Deckedge Operator
Safety Bridle Hookup
Deck Control
Engine Room Operator
Deckedge Talker

5. *General Physical Requirements*

- a. Exhibit mobility for hookup, hook running, etc.
- b. Exhibit mobility to handle fire-fighting equipment.
- c. Ability to operate and maintain catapults and arresting gear.
- d. Exhibit dexterity to use hand and power tools.
- e. Exhibit dexterity to make wire rope sockets.
- f. Distinguish color codes of steam, air, liquid lines.

6. *Billet Environment*

Not identified.

7. *General Work Assignment*

The ABE is responsible for the repair and maintenance of the following:

Jet Blast Deflectors
Catapults
Barricade Engines
Pendant Engines
Arresting Gear

Aviation Fire Control Technician (AQ)

1. *Scope of Duties*

Aviation Fire Control Technicians inspect and perform organizational and intermediate maintenance on aircraft weapons systems, including weapons control radar, computers, computing sights, gyroscopes, accessories, and related equipment; and air launched guided missile equipment.

2. *Special Physical Requirements*

Normal color perception.

3. *Related Civilian Jobs*

Computer Repair
Electronics

4. *Typical Billets*

Not identified.

5. *General Physical Requirements*

- a. Distinguish electrical color codes.
- b. Exhibit mobility to install electronic equipment on aircraft.
- c. Exhibit mobility to inspect aircraft weapons systems.
- d. Exhibit dexterity to operate shop equipment.
- e. Visual acuity to boresight components.

6. *Billet Environment*

Not identified.

7. *General Work Assignment*

Not identified.

Aviation Support Equipment Technician (AS)

1. *Scope of Duties*

Aviation Support Equipment Technicians service, test, and perform organizational and intermediate level maintenance and repair of aviation support equipment, aviation armament handling equipment and associated components and systems, including gasoline and diesel engines, hydraulic and pneumatic systems, automotive electrical systems, gas turbine compressor units, power generating equipment, and air-conditioning systems, but excluding avionics support equipment; perform structural and body repair and painting of aviation support equipment; perform periodic maintenance inspections of aviation support equipment; and provide training in the operation and servicing of aviation support equipment.

Aviation Support Equipment Technician E (Electrical) (ASE)

Aviation Support Equipment Technicians (E) service, test, and perform organizational and intermediate level maintenance and repair of automotive electrical systems in mobile and self-propelled aviation support equipment, aviation armament handling equipment, including generating, starting, lighting, and ignition systems, electrical components and wiring in auxiliary electrical power units used in servicing aircraft, electrical control systems in gas turbine compressor units and air-conditioning systems, and electrical and electronic circuits and components in general aircraft servicing equipment; service and maintain storage batteries; and perform periodic maintenance inspections of aviation support equipment.

Aviation Support Equipment Technician H (Hydraulics and Structures) (ASH)

Aviation Support Equipment Technicians (H) service, test, and perform organizational and intermediate level maintenance and repair of hydraulic and pneumatic systems and structural components of aviation support equipment; maintain hydraulic test and service equipment, air compressors, jacks, work stands, and associated equipment; perform body and fender metal work and painting of aviation support equipment; weld, braze, solder, cut, shape, and patch metal; adjust and repair brake systems; inspect and replace tires and tubes; operate hydraulic test stands; and perform periodic maintenance inspections of aviation support equipment.

Aviation Support Equipment Technician M (Mechanical) (ASM)

Aviation Support Equipment Technicians (M) service, test, and perform organizational and intermediate level maintenance and repair of gasoline and diesel engines in mobile and self-propelled aviation support equipment and associated automotive systems, including fuel systems; maintain gas turbine compressor units and air-conditioning systems used in servicing aircraft; maintain and operate gas turbine compressor unit test stands; and perform periodic maintenance inspections of aviation support equipment.

2. *Special Physical Requirements*

Normal color perception. Vision correctable to 20/20.

3. *Related Civilian Jobs*

Mechanic

Welder

Electrician

4. *Typical Billets*

NBC Monitor

Messenger

Assemblyman

Nozzelman

Maintenance Technician

5. *General Physical Requirements*

- a. Dexterity to replace seals and packing.
- b. Dexterity to operate support equipment.
- c. Dexterity to make engine tune-ups (ASM).
- d. Dexterity to repair gas and diesel engines (ASM).
- e. Dexterity to service transmissions, clutches, etc. (ASM).
- f. Dexterity to rivet (ASH).
- g. Dexterity to repair tires and tubes (ASH).
- h. Dexterity to weld and solder (ASH).
- i. Exhibit general strength to perform body and fender work (ASH).
- j. Dexterity to service automotive electrical systems (ASE).
- k. Exhibit general strength to use hoists and jacks.
- l. Dexterity to use hand tools.

6. *Billet Environment*

Not identified.

7. *General Work Assignment*

Not identified.

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Arlington Annex
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Department of the Navy
3701 Arlington Annex
Washington, DC 20370

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Bureau of Personnel, Pers A-3
Department of the Navy
Room 3701 Arlington Annex
Washington, DC 20370

Dr. D. E. Broadbent
Director, Applied Psychology Unit
Medical Research Council
15 Chaucer Road
Cambridge CB2 2EF
ENGLAND

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Denver, CO 80222

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